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MYCOTAXON

AN INTERNATIONAL JOURNAL FOR RESEARCH ON TAXONOMY & NOMENCLATURE OF FUNGI, INCLUDING LICHENS

Volume LIV April-June 1995

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MYCOTAXON

Volume LIV, pp. 1-17 April-June 1995

A PRELIMINARY DISCOMYCETE FLORA OF MACARONESIA: PART 9, VIBRISSEACEAE[1]

TERESITA ITURRIAGA[2]

Plant Pathology Herbarium, Cornell University, Ithaca, NY 14853, USA

> "Rivers are highways that move on, and
> bear us whither we wish to go."
> Blaise Pascal (translated by O. W. Wright)
> THOUGHTS, Stanza 3

Order HELOTIALES
Suborder HYMENOSCYPHINEAE
Family VIBRISSEACEAE Korf 1991

ONE KNOWN MACARONESIAN GENUS

VIBRISSEA Fr. : Fr. 1822
= *Apostemidium* P. Karst. 1871

Notes: This genus for mainly aquatic or aeroaquatic discomycetes has earlier been incorrectly placed in the families Geoglossaceae, Leotiales (Durand, 1908; Seaver, 1951), Ostropaceae (= Stictidaceae), Ostropales (Nannfeldt, 1932; Dennis, 1958, 1968, 1978; Korf, 1973; Breitenbach & Kränzlin, 1981; Baral & Krieglsteiner, 1985), Helotiaceae, Helotiales (Cannon, Hawksworth, & Sherwood-Pike, 1985).

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[1] The parts of this flora will appear in irregular order. Offprints of this part may be requested from the Plant Pathology Herbarium at Cornell University. For special features of this flora, see *Mycotaxon* **13:** 144. 1981.

[2] Present address: Departamento de Biología de Organismos, Universidad Simón Bolívar, Apartado 89000, Sartenejas, Baruta, Edo. Miranda, Venezuela. Travel to Cornell University to pursue this research was received from "División de Desarrollo Profesoral" of Simón Bolívar University and from "Fundación Vollmer," which is gratefully acknowledged.

Sánchez & Korf (1966) divided this genus into four sections, *Vibrissea, Leucovibrissea* A. Sánchez, *Apostemium* (P. Karst.) A. Sánchez & Korf, and *Microstemium* A. Sánchez & Korf, emphasizing differences in apothecial color, presence or absence of a stipe, paraphysis apices, and ascus and ascospore measurements. They treated the generic names *Apostemium* (P. Karst.) P. Karst. and *Apostemidium* P. Karst. as synonyms of *Vibrissea*. Sánchez (1967) treated the sections *Apostemium* and *Microstemium,* and gave descriptions of the known species. The extensive synonymies he reported are not repeated here. Nevertheless I have chosen to fully describe each species of the Macaronesian Vibrisseas, from dried specimens. The four known Macaronesian *Vibrissea* species all belong to section *Apostemium*. More detailed information is given, and some differences from Sánchez's descriptions are noted.

The family Vibrisseaceae was recently erected (Korf, 1991) to embrace the genera *Vibrissea* Fr. : Fr., Syst. mycol. **2**(1): 31. 1822, *Chlorovibrissea* L. M. Kohn, Mem. New York Bot. Gard. **49:** 113. 1989, and *Leucovibrissea* (A. Sánchez) Korf, Mycosystema **3:** 23. 1991, displaying frequent underwater discharge of their filiform ascospores and adaptation of the ascospores for water dispersal.

Vibrissea is easily distinguished by its habitat, filiform to long cylindrical ascospores, and disposition of the cells of the ectal excipulum. But in order to key out the species, some structures are difficult to observe and measure individually, such as long cylindrical asci, paraphyses, and long filiform ascospores, since they break easily. When working with specimens of this genus, it is advisable to soak a thick (±100 μm) apothecial section in water for a long time, and then gently separate the hymenial tissues with the help of two insect pins. Only after this operation a cover slip may be used, pressed gently with an eraser. Melzer's Reagent or stains can be added later by placing a drop to one side of the coverslip and drawing it through with a piece of filter paper on the opposite side. Asci then may be individually seen and measured, as well as paraphyses. Since frequently in this genus ascospores break inside the ascus, often only pieces can be measured. The term "perihymenial zone" is used as in Sánchez & Korf (1966) to designate a layer lying above the medullary excipulum, between the hymenium and the ectal excipulum at the margin, J+ in Melzer's Reagent, unstained in cotton blue, and first noted by Nannfeldt (1932).

VIBRISSEA Section APOSTEMIUM (P. Karst.) A. Sánchez & Korf 1966

Key to the known Macaronesian species

1. Apothecia with a short stipe or pseudostipe, scattered or gregarious **2**

1´. Apothecia sessile, scattered, gregarious or confluent **3**

2. Apothecia 1–2 mm in diameter, with a short stipe 146–220 µm tall, disc yellowish, receptacle brown; hymenium making up 1/4 of the apothecial height; moniliform cells of the ectal excipulum agglutinated in a wart–like manner; perihymenial zone light blue J+; medullary excipulum J+; asci 215–280 × 8–9 µm, ascus pore J–, ascus stalk short, 5–12 µm long; ascospores 1.5 µm wide, disarticulating into several parts inside the ascus; paraphyses generally simple, sometimes divided **3. V. flavovirens**

2´. Apothecia 1–2 mm in diameter, with a pseudostipe, disc yellowish–orange, receptacle dark–brown; hymenium making up 1/2 to 3/4 of the apothecial height; moniliform cells of the ectal excipulum elongating as hairlike projections; perihymenial zone J+ changing from blue to light wine red; medullary excipulum J–; asci 168–280 × 5.6–9.3 µm, ascus stalk 31–54 µm long, ascus pore J+; ascospores not observed to disarticulate inside the ascus, 2 µm wide; paraphyses generally simple **1. V. decolorans**

3. Apothecia frequently confluent, receptacle white to whitish with broad brown base; hymenium making up about 1/2 of the apothecial height, disc concolorous with the receptacle; no moniliform cells present on the ectal excipulum; asci clavate, 112–187 × 6–10 µm, ascus stalk 7.7–19.2 µm long; ascospores long cylindric, multiseptate, 35–60 × 1.5–3 µm, not disarticulating inside the ascus, in two bundles of four, one above the other; paraphyses simple or dividing once **4. V. strossmayerioides**

3′. Apothecia simple or gregarious but never confluent, receptacle brown with a small base; hymenium making up 3/4 of the apothecial height; disc buff; moniliform cells on the ectal excipulum grouped together in warts; asci long cylin–

drical, 168–262 × 5.4–6.9 µm, ascus stalk 13–16 µm long; ascospores filiform, multiseptate, in a single bundle, 120–206 × 0.8–1.5 µm, disarticulating inside the ascus; paraphyses often branching in fascicles of 3
2. V. filisporia forma **boudieri**

1. **Vibrissea decolorans** (Saut.) A. Sánchez & Korf in A. Sánchez, J. Agric. Univ. Puerto Rico **51**: 83, 1967.
FIGS. 1 & 2.

APOTHECIA sessile, 1–2 mm in diameter, with a pseudostipe. RECEPTACLE dark brown, warty, margin crenulate. DISC buff to yellowish-orange, convex, rising above the receptacle. HYMENIUM making up 1/2 to 3/4 of the apothecial height. ECTAL EXCIPULUM of textura globulosa with roundish to irregular cells; outer ectal dark-brown, forming warts consisting of groups of dark-brown rounded cells, cells 9.2–18.5 × 5.4–9.2 µm; at the margin mainly, but sometimes also at flanks, cells elongating and forming hair-like projections which are composed of several cells, cells (4.6–) 7.7–13.8 × 1.5–6.2 µm, end cells with acute apices; inner ectal of elongated cells, tissue structure close to textura porrecta with hyphae growing outwards perpendicular to the apothecial surface, cells 13.1–30.8 × 4.6–7.7 (–10.8) µm; perihymenial zone of textura oblita, formed of thin hyphae lying parallel to the hymenium, J+ for some time after adding Melzer's Reagent, staining light wine red in Melzer's Reagent once the J+ reaction is gone. MEDULLARY EXCIPULUM of textura globulosa–prismatica with roundish to irregular cells 15.4–30.8 (–38.4) × (9.2–) 13.8–20.0 (–24.6) µm. PSEUDOSTIPE short, of textura globulosa in the medulla, smaller cells in the cortex. ASCI long-cylindrical, 168–280 × 5.6–7.5 (–9.3) µm, with a long stalk 30.8–53.8 µm long, 8–spored; ascus pore clearly J+ with or without KOH pretreatment. ASCOSPORES filiform, septate, with the apical end more blunt and the basal end more acute, 135–250 × 2 µm. PARAPHYSES generally simple, sometimes divided, 1.5 (–2.3) µm wide in the middle, widening at the apex in a clavate shape, where 1.5–3.8 µm wide.

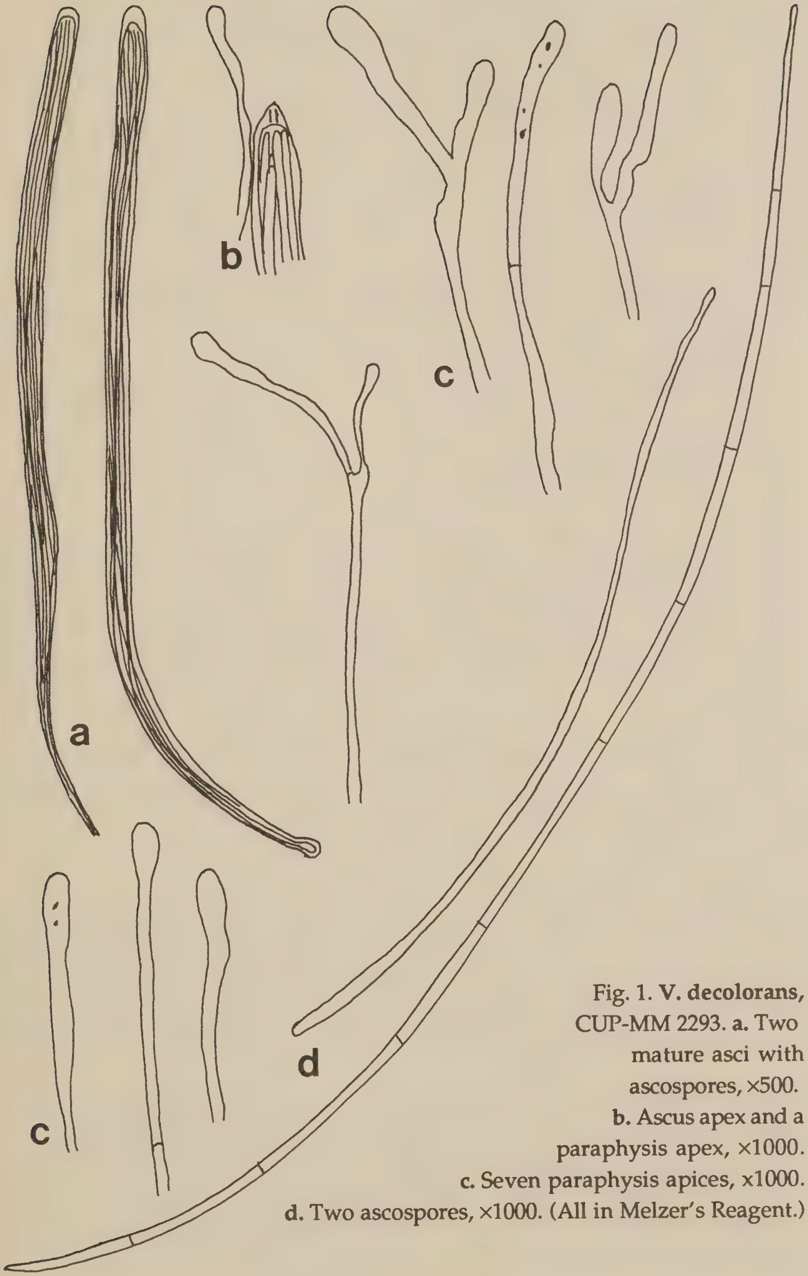


Fig. 1. **V. decolorans,** CUP-MM 2293. **a.** Two mature asci with ascospores, ×500. **b.** Ascus apex and a paraphysis apex, ×1000. **c.** Seven paraphysis apices, x1000. **d.** Two ascospores, ×1000. (All in Melzer's Reagent.)

RECENT TAXONOMIC TREATMENTS:
Sánchez & Korf (1966), Sánchez (1967).

PREVIOUS MACARONESIAN RECORDS:
None.

TYPE LOCALITY:
Salzburg, Austria.

KNOWN MACARONESIAN DISTRIBUTION

MADEIRA
Madeira. CUP–MM 2293.

SUBSTRATUM:
On wood in stream.

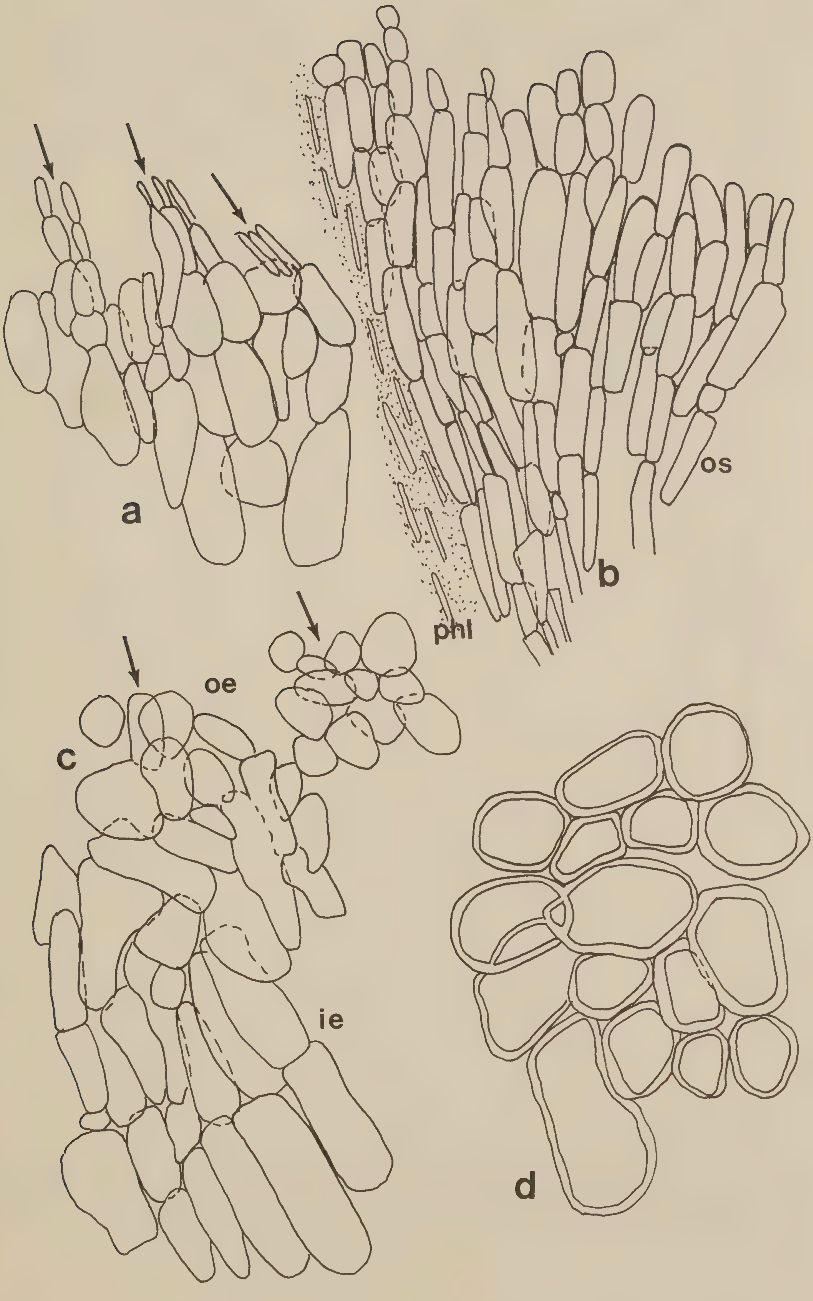
Notes: Measurements of asci, ascospore length and paraphysis width at the apex are smaller than the ones given by Sánchez & Korf in Sánchez (1967), namely 270–360 µm for asci, 250–350 µm for ascospores, and 4–6 µm for paraphysis apices. They did not record a change to a wine red coloration of the perihymenial zone in iodine.

2. **Vibrissea filisporia** (Bonord.) Korf & A. Sánchez f. **boudieri** A. Sánchez & Korf in Sánchez, J. Agric. Univ. Puerto Rico **51**: 83, 1967.

FIGS. 3, 4 & 5.

APOTHECIA sessile, discoid, 0.75–1 mm in diameter. RECEPTACLE brown. DISC convex, buff when rehydrated. HYMENIUM making up to 3/4 of the apothecium, asci taking up most of the height. ECTAL EXCIPULUM brown, 65.3–76.4 µm wide, of textura globulosa, with cells turning outwards

Fig. 2. **V. decolorans**, CUP-MM 2293. **a.** Detail of ectal excipulum at margin showing the hair-like projections (arrows). **b.** Detail of ectal excipulum at margin, os: outer surface; phl: perihymenial layer. **c.** Detail of ectal excipulum at flanks, showing the verrucose outer surface (arrows), oe: outer ectal excipulum; ie: inner ectal excipulum. **d.** Detail of medullary excipulum. (All ×1000, all in Melzer's Reagent.)


a
b
os
phl
c
oe
ie
d

perpendicular to the surface of the apothecium, outer cells moniliform in short chains of brown cells giving the receptacle an irregular surface, cells (9.2–) 13.8–27.7 x 6.9–19.2 µm, end cells swollen and rounder. Inner ectal excipulum and perihymenial zone of textura oblita, long celled, both strongly J+ in Melzer's Reagent. SUBHYMENIUM of textura intricata. MEDULLARY

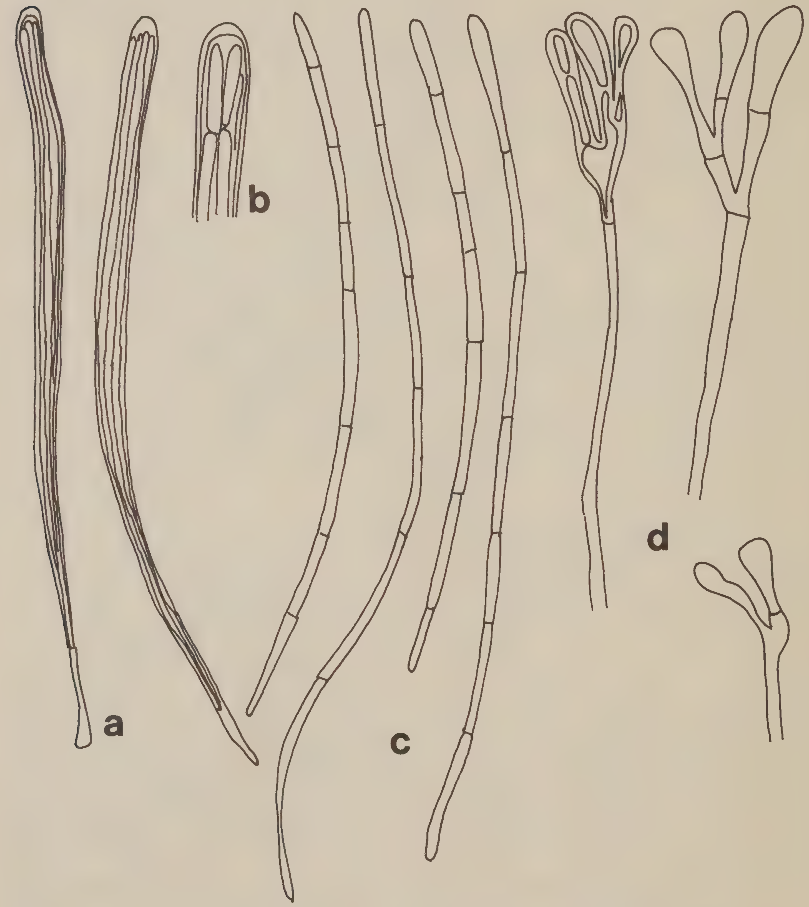


Fig. 3. V. **filisporia** f. **boudieri**, CUP-MM 2402. **a.** Two mature asci with ascospores, ×500. **b.** Ascus apex, ×1000. **c.** Four ascospore fragments, ×1000. **d.** Three paraphysis apices, ×1000. (All in Melzer's Reagent.)

EXCIPULUM of textura globulosa, cells 23.1–32.3 (–42.2) x 15.4–29.3 µm, J–. ASCI long cylindrical, stalk short, ascus pore J– with and without 10% KOH pretreatment, (168–) 181–262 × (5.4–) 6.2–6.9 µm, stalk 13–16 µm long. ASCOSPORES filiform, breaking in several pieces inside the ascus, septate, generally straight or sometimes sinuate inside the ascus, (120–) 187–206 × 0.8–1.5 µm. PARAPHYSES branched 2–3 times, often fasciculately branched, septate, 0.8–1.5 (–2.3) µm wide in the middle, enlarging at the apex where 3.1–4.6 µm wide.

RECENT TAXONOMIC TREATMENTS:
Sánchez & Korf (1966), Sánchez (1967).

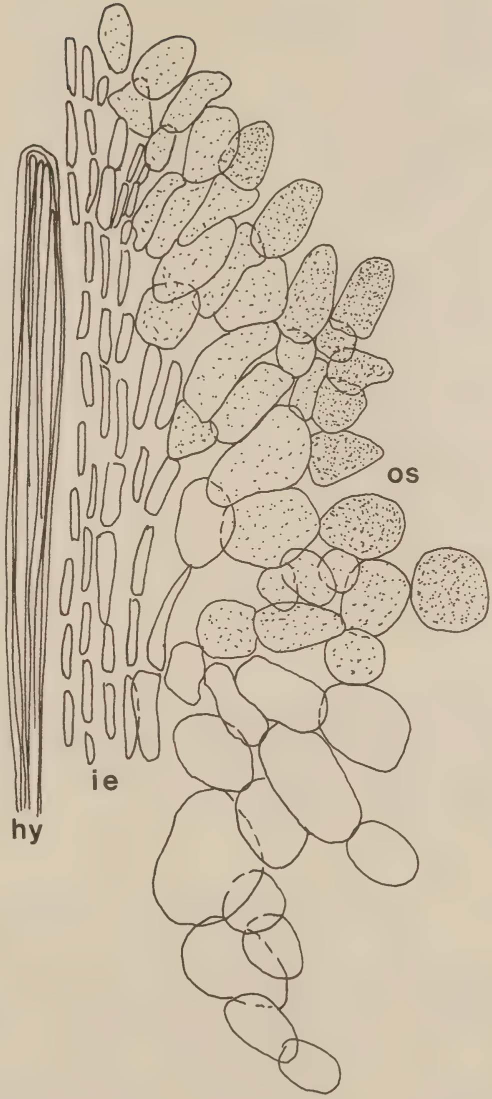


Fig. 4. **V. filisporia f. boudieri**, CUP-MM 2402. Detail of ectal excipulum at margin, os: outer surface; ie: inner ectal excipulum; hy: hymenium, ×1000, in Melzer's Reagent.

PREVIOUS MACARONESIAN RECORDS:
None.

TYPE LOCALITY:
Schimpach, Luxemburg.

KNOWN MACARONESIAN DISTRIBUTION

MADEIRA
Madeira.
CUP–MM 2300 (TFC), CUP–MM 2402.

SUBSTRATA:
On vine in stream, on vine in stream spray.

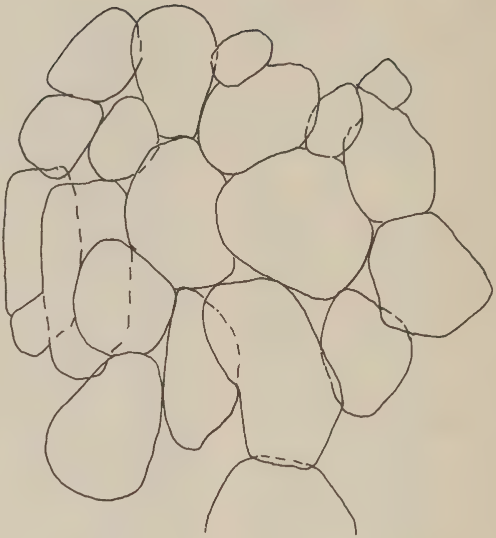


Fig. 5. **V. filisporia f. boudieri,** CUP-MM 2402. Detail of medullary excipulum, ×500, in Melzer's Reagent.

Note: Ascospores are shorter than in the description in Sánchez (1967). I did not observe the blueing reaction of the medullary excipulum under iodine reported as being frequent by Sánchez. Other characters agree.

3. **Vibrissea flavovirens** (Pers. : Fr.) Korf & J. R. Dixon in Korf, Mycotaxon **1:** 134. 1974.

≡ *Peziza flavovirens* Pers., Myc. eur. **1:** 323. 1822 : Fries, Syst. mycol. **2**(1): 139. 1822.
= *Vibrissea pezizoides* Lib. ex W. Phillips, Trans. Linn. Soc. London, Bot. II **2:** 8. 1881.

FIGS. 6 & 7.

APOTHECIA 1–2 mm in diameter, with a short stipe. RECEPTACLE brown. DISC whitish-yellowish, slightly convex. HYMENIUM making up 1/4 of the apothecial height. ECTAL

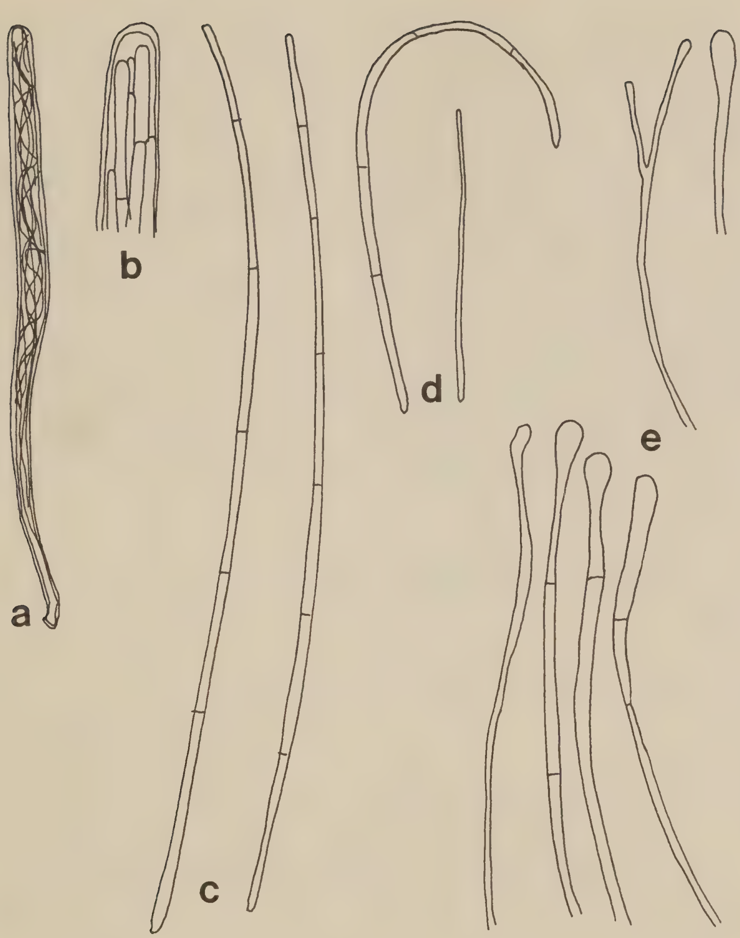


Fig. 6. **V. flavovirens. a.** Mature ascus with coiled ascospores, ×500. **b.** Ascus apex, ×1000. **c.** Two ascospore fragments, ×1000. **d.** Two ascospore fragments, ×500. **e.** Six paraphysis apices, ×1000. (**a-c, e,** CUP-MM 2305; **d,** CUP-MM 2340.) (All in Melzer's Reagent.)

EXCIPULUM of textura prismatica to porrecta, with hyphae turning outwards perpendicular to the surface of the apothecium; outer ectal dark brown, with chains of moniliform brown cells, all agglutinated in a wart-like manner, giving the receptacle a bumpy appearance, end cells round to pyriform and swollen, cells 7.7–15.4 × 5.4–9.2 µm; inner ectal cells packed together, cells (9.2–) 15.4–29.3 × 6.2–7.7 µm; perihymenial zone of textura oblita, hyphae running parallel to the apothecial surface, light J+. SUBHYMENIUM of textura intricata. MEDULLARY EXCIPULUM J+, of textura globulosa with globose to irregular cells, 14.6–30.8 × 10.8–16.9 µm. STIPE 146–220 µm tall; medulla of textura globulosa with large rounded cells, cells 20.8–38.4 (–47.7) × 11.5–23.1 (–26.9) µm, larger towards the center of the stipe where up to 103 × 56 µm; cortex with smaller very dark cells packed together, cells 8.5–13.1 × 4.6–7.7 µm. ASCI long cylindrical, J–, 215 × 7.7–8.5 µm, with a short stalk 5–12 µm long. ASCOSPORES filiform, straight or sigmoid inside the ascus, in a bundle, disarticulating in several pieces inside the ascus, 167–250 × 1.5 µm. PARAPHYSES mostly simple, sometimes divided, long, septate, 1.5 (–2.3) µm wide in the middle, slightly enlarged at the apex where 2.3–3.1 (–3.8) µm wide.

RECENT TAXONOMIC TREATMENTS:

Sánchez & Korf (1966), Sánchez (1967), Dixon (1972), Korf (1974).

PREVIOUS MACARONESIAN RECORDS:

None

TYPE LOCALITY:

Vosges Mountains, France.

KNOWN MACARONESIAN DISTRIBUTION

MADEIRA

Madeira. CUP-MM 2305, CUP-MM 2340.

SUBSTRATA:

On wood in stream, on wet wood in streamlet.

Notes: Sánchez & Korf's ascospore measurements are 160–230 × 1–2 µm (Sánchez, 1967). All data agree with their description of *Vibrissea pezizoides* Lib. ex Phillips, which Korf (1974) showed was a later synonym of Persoon's species, except for the length of the ascus stalk, which is described by them as being 50–70 µm long. I was not able to see the place of disarticulation of the

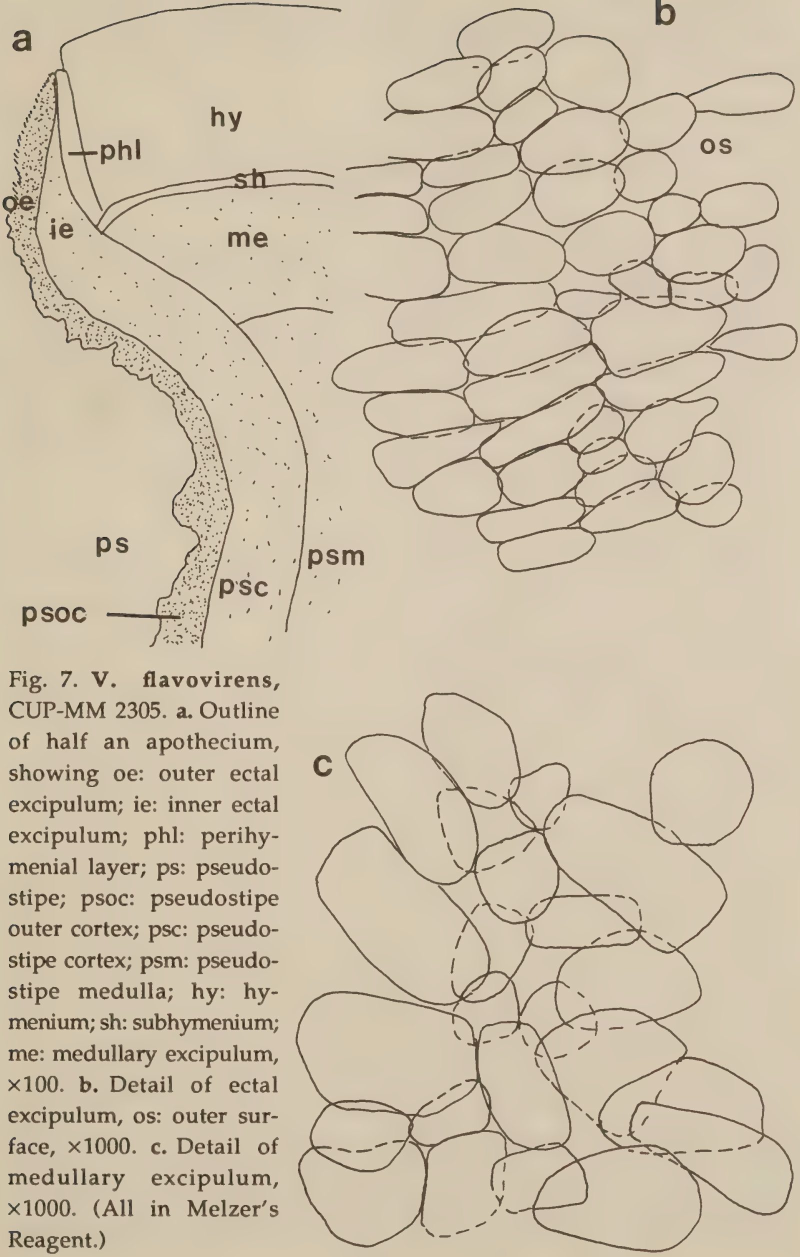


Fig. 7. **V. flavovirens,** CUP-MM 2305. **a.** Outline of half an apothecium, showing oe: outer ectal excipulum; ie: inner ectal excipulum; phl: perihymenial layer; ps: pseudostipe; psoc: pseudostipe outer cortex; psc: pseudostipe cortex; psm: pseudostipe medulla; hy: hymenium; sh: subhymenium; me: medullary excipulum, ×100. **b.** Detail of ectal excipulum, os: outer surface, ×1000. **c.** Detail of medullary excipulum, ×1000. (All in Melzer's Reagent.)

ascospores inside the ascus. Sánchez (1967) reports them as often disarticulating in the middle inside the ascus and liberated from the ascus as such.

4. **Vibrissea strossmayerioides** Korf & Iturriaga, *n. sp.*
FIGS. 8 & 9.

Apothecia sessilia, confluentia, turbinata, 0.75–1.0 mm diam, 0.4–0.5 mm alta, alba vel eburnea vel bubalina secundum rehydrationem, viridula in 10% KOH aquoso; asci clavati, J—, 112–187 × 5.9–10.0 µm, octospori; ascosporae longe cylindricae, dispositae in fasciculis duobus superpositis et sporas quattuor singulatim continentibus, (35.4–) 39.9–60 × 1.5–3.1 µm; paraphyses simplices vel divisae, filiformes, 1.5 (–3.8) µm latae, versus apicem 2.3–3.8 (–5.4) µm latum dilatatae. Ad lignum cariosum prope rivulum. Holotypus: CUP–MM 2314.

APOTHECIA sessile, confluent, turbinate, waxy-gelatinous, 400–500 µm tall, diameter 0.75–1 mm, brownish-transparent when dry, greenish in 10% KOH. RECEPTACLE upper and middle portions concolorous, white-cream-buff when rehydrated, brownish towards the base, point of attachment brown, broad. DISC concolorous. HYMENIUM hyaline, making up 4/10 to 1/2 of the apothecial height, gelatinized. ECTAL EXCIPULUM 65–95 µm wide, outer and inner ectal excipulum of textura epidermoidea to prismatica at margin, textura prismatica to globulosa at flanks, cells rounder and smaller towards the surface, cells oriented perpendicular to the apothecial surface; outer ectal excipulum very pale, inner and innermost ectal excipulum cream coloured, outer and inner ectal excipular cells 10–26.9 (–36.2) × 3.8–15.4 (–24.6) µm; perihymenial zone of textura oblita, strongly J+, cells (7.8–) 14–23.1 × 1.5–3.1 µm. MEDULLARY EXCIPULUM of small-celled textura globulosa-prismatica mixed with elongated cells, all gelatinized, J–, cells 6.9–12.3 × 3.8–8.5 µm. SUBHYMENIUM of textura globulosa-prismatica, very small-celled. ASCI clavate, difficult to see individually due to gelatinized hymenium, 112–187 × 5.9–10.0 µm, ascus stipe 7.7–19.2 µm long, ascus pore J–, with or without 10% KOH pretreatment, 8–spored. ASCOSPORES long-cylindric, multiseptate, usually with both ends tapering and wider in the

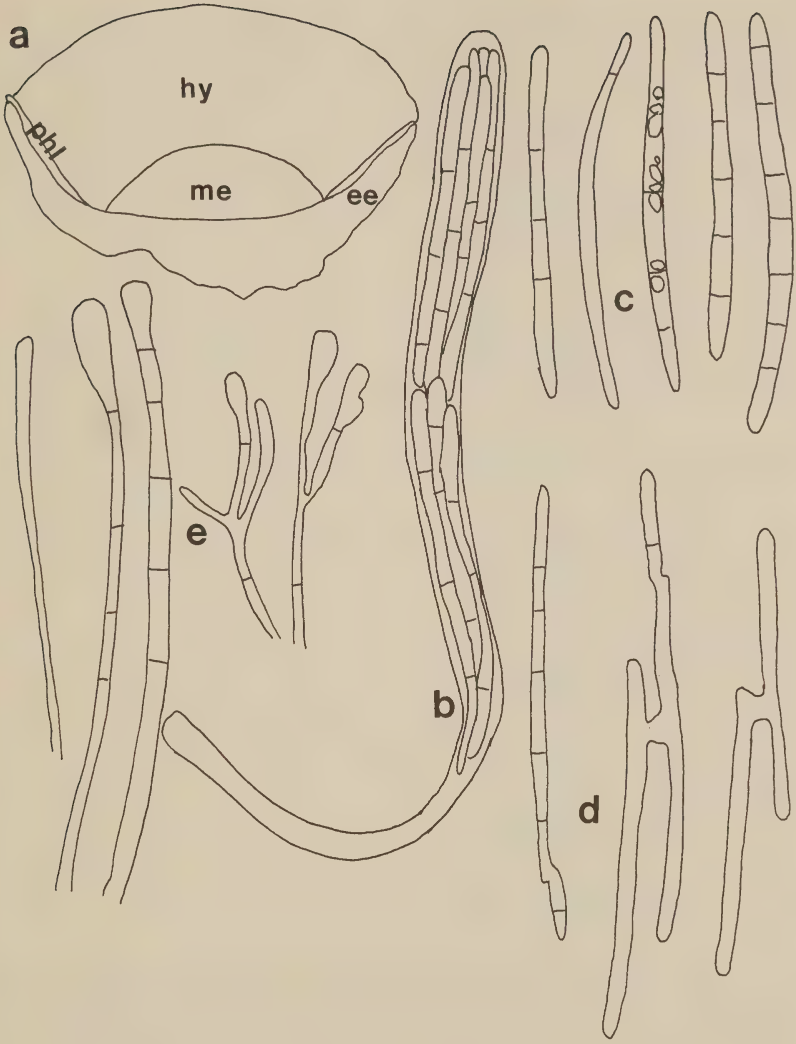


Fig. 8. **V. strossmayerioides,** CUP-MM 2314. **a.** Outline of an apothecium, showing ee: ectal excipulum; phl: perihymenial layer; me: medullary excipulum; hy: hymenium, ×100. b. Ascus with ascospores, ×1000. c. Five ascospores, ×1000. d. One ascospore presumably germinating, and two pairs of ascospores fused into an "H"-shape, ×1000. e. Five paraphysis apices, three simple, two branched, ×1000. (All in Melzer's Reagent.)

middle, sometimes with the basal end slightly tapering and the apical end rounder, septate, dextrinoid in Melzer's Reagent, turning brownish-wine coloured, in two bundles of four spores one above the other, ascospores sometimes seeming to fuse in an "H-shape" (resembling Tilletiales, see Fig. 8d), (35.4–) 39.9–60 × 1.5–3.1 µm, cells ca. 9 µm long. PARAPHYSES simple or divided, filiform, septate, 1.5 (–3.8) µm wide in the middle, inflating towards the apex where 2.3–3.8 (–5.4) µm wide.

HOLOTYPE:

CUP-MM 2314. On rotted wood. MADEIRA, at stream just S. of Santo da Serra, at km mark 18, 21 April 1978, leg. R. P. Korf, L. M. Kohn, N. Korf, A. Y. Rossman.

RECENT TAXONOMIC TREATMENTS:

None.

PREVIOUS MACARONESIAN RECORDS:

None.

TYPE LOCALITY:

S. of Santo da Serra, Madeira.

KNOWN MACARONESIAN DISTRIBUTION

MADEIRA

Madeira. CUP-MM 2314.

SUBSTRATUM:

On rotted wood.

Notes: This species was cultured in tubes when collected, but no growth nor germination was seen. The shorter clearly dextrinoid ascospores, the shorter clavate asci, and the confluent apothecia make this a new species, belonging to sect. *Apostemium*, but shorter-spored than any of the species treated by Sánchez (1967). It does not belong to sect. *Microstemium* with smaller apothecia (not exceeding 0.5 mm in diam) and broader ascospores (3.0–3.5 µm). The epithet *'strossmayerioides'* is proposed because of the resemblance to some species of the genus *Strossmayeria* that also have confluent apothecia, and a similar ascospore shape.

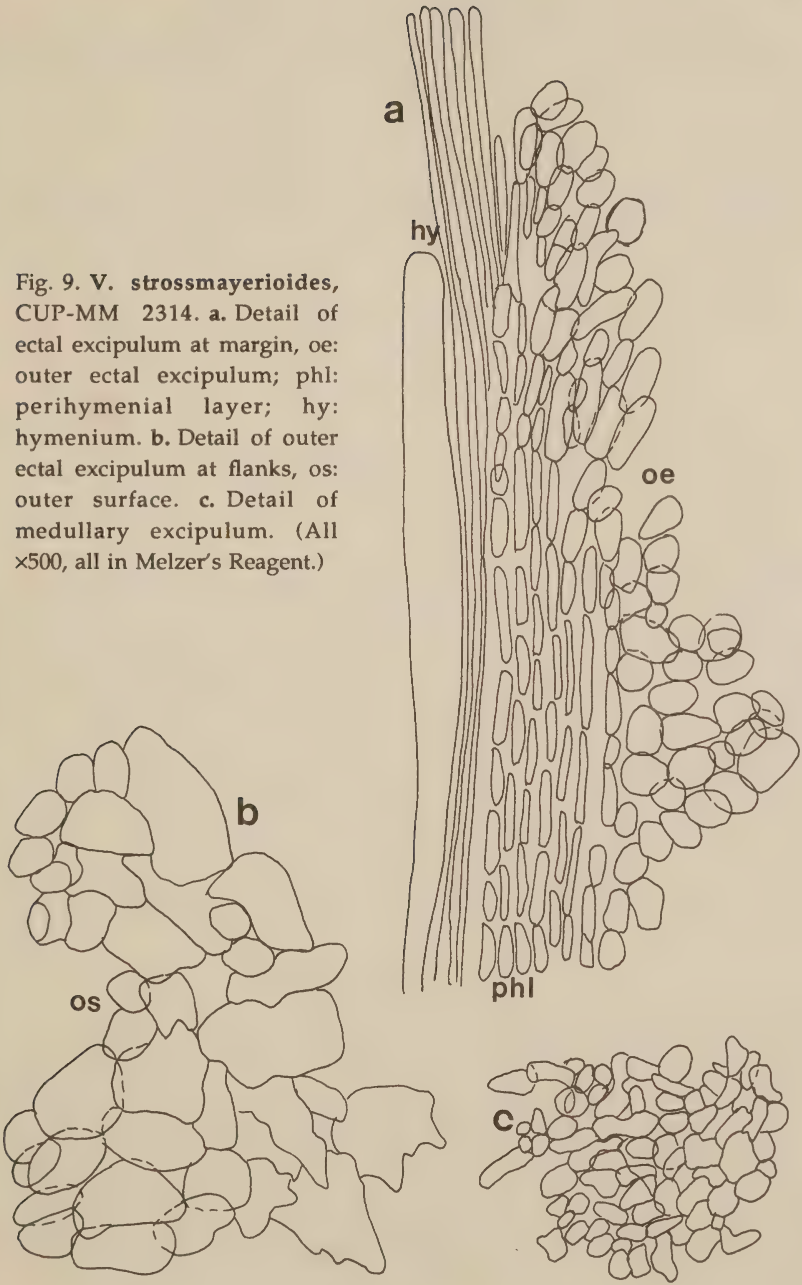


Fig. 9. **V. strossmayerioides**, CUP-MM 2314. **a.** Detail of ectal excipulum at margin, oe: outer ectal excipulum; phl: perihymenial layer; hy: hymenium. **b.** Detail of outer ectal excipulum at flanks, os: outer surface. **c.** Detail of medullary excipulum. (All ×500, all in Melzer's Reagent.)

MYCOTAXON

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AGARICOSTILBUM NOVA-ZELANDICA, A NEW AURICULARIOID FUNGUS ON *RHOPALOSTYLIS SAPIDA* FROM NEW ZEALAND

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and
Xiandi Gong

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Examining collections made by one of us in New Zealand, we found an unusual fungus growing in a decaying inflorescence of the native palm, *Rhopalostylis sapida* H. Wendl. & Drude, which exhibits some characters that collectively do not appear to fit into any known genus: (1) long fertile hyphae (often fasciculate toward the base), septate only in the apical and basal regions, (2) a linear series of four (occasionally up to 7) integrated sporogenous cells at the apex of each fertile hypha, (3) the development on each fertile cell of a localized, swollen, initially hump-like but ultimately vesicular structure producing a cluster of sporogenous loci each bearing a non-septate spore. This structure, while apical on the terminal cell of the fertile hypha, is lateral, always on the same side of, and positioned just below the upper septum of, the sub-apical sporogenous cells (Figs. 1, 2, 3, 4, 5).

This unusual suite of characters invites comparison with only one or two known fungal genera, notably *Agaricostilbum* Wright (1970) [which was emended by Subramanian and Natarajan (1977), and again by Wright, Bandoni and Oberwinkler (1981)], and *Microstroma* Niessl (1861), although species of both of these genera produce synnema-like aggregations, rather than individual fertile hyphae. Nevertheless, in both genera the free upper parts of the fertile hyphae clearly exhibit features (2) and (3) noted above. This similarity between *Agaricostilbum* and *Microstroma* was briefly noted by Carmichael et al. (1980) (who referred, however, to *Amerobotryum* Subramanian et Natarajan, a synonym of *Agaricostilbum*). *Atractiella* Saccardo : Saccardo (1886) is also similar to our fungus, but produces only one spore from each fertile cell. *Agaricostilbum* and *Atractiella* were originally described as conidial fungi (synnematal hyphomycetes), but are now regarded as gasteroid or sequestrate basidiomycetes, and were placed in a new order, Atractiellales, by Oberwinkler and Bandoni (1982). Later, Oberwinkler and Bauer (1989), having accumulated a wider range of data on *Agaricostilbum*, decided that it occupied a rather isolated position in the basidiomycetes, and erected the new order Agaricostilbales for it.

In the meantime, the taxonomic position of *Microstroma* must be regarded as uncertain, since it (like *Atractiella* and *Agaricostilbum*) was described as a hyphomycete, but there seems to be a possibility that it, like *Agaricostilbum*, may eventually be determined to be a basidiomycete.

In a recent discussion of the taxonomy of synnematal hyphomycetes, Seifert and Okada (1990) noted that although the production of synnemata had been an extremely important character in the Saccardoan system of classification, this feature was downgraded by Hughes (1953) and other subsequent workers, who considered conidium ontogeny to be of much greater importance. Seifert and Okada noted that several genera incorporate both mononematous and synnematous species (e. g. *Penicillium* Link, *Aspergillus* Micheli : Link, and *Hirsutella* Patouillard).

This led us to consider incorporating our new fungus in one of the described genera, rather than erecting a new genus for it. Leaving aside the issue of the possible synonymy between *Agaricostilbum* and *Microstroma*, while noting that both genera have yeast-like growth phases (Carmichael et al., 1980; Oberwinkler et al., 1982) we decided that our fungus resembled the former more closely. This suggestion of relationship is reinforced by the fact that our fungus and *A. pulcherrimum* (Berk. & Broome) Brady, Sutton et Samson, the type species of *Agaricostilbum*, both occur on palm spathes (*Agaricostilbum pulcherrimum* on *Butia*, *Cocos* and *Phoenix* [though also on *Xanthorrhoea* sp: Liliaceae], and our new species on *Rhopalostylis*). *Microstroma* has been found on dead leaves of *Juglans* and *Carya* (Juglandaceae).

These examples, and the overwhelming similarity between the development and anatomy of the fertile cells of our fungus and those of *Agaricostilbum* spp., led us to dispose our new species as the third species of *Agaricostilbum*. The placement of our new species in *Agaricostilbum* necessitates some further emendation of the generic diagnosis.

Agaricostilbum Wright emend. Kendrick et Gong.

Agaricostilbales, Basidiomycotina.

Hyphae colourless, septate, lacking clamp connections, septal pores simple. Basidiomata either: (1) stipitate, stilboid, capitate, white, fleshy-waxy, not bound together by gelatinous matrix; or (2) reduced to loosely fasciculate fertile hyphae. Usually growing on palm spathes. Cystidia absent. Fertile hyphae colourless, bearing apical, integrated basidia; clamps absent. Basidia colourless, transversely 3-septate ["auricularioid" sensu Oberwinkler & Bandoni (1981)] (occasionally up to 6-septate), each cell producing several basidiospores from closely aggregated loci on an outgrowth which, following repeated spore formation, is ultimately vesicular. This outgrowth is apical on the uppermost cell of the basidium, but lateral on the three lower cells (the vesicle arises just below the upper septum of each cell, and on the same side in all three). Basidiospores colourless, non-amyloid, non-septate, more or less ellipsoidal, not forcibly discharged, germinating to produce a yeast-like phase.

Agaricostilbum nova-zelandica Kendrick et Gong sp. nov. (Figs. 1, 2, 3, 4, 5)

Ad Agaricostilbales, Basidiomycotina, pertinens. Hyphae fertiles non ramosa vel ramosa, sparsa vel fasciculata, hyalina, clavata, echinulata, septata, 2.5-5.0 µm lat., 155-300 µm long. Basidia in hyphis incorporata. Basidiospora in apiculibus et lateralibus, gibberibus locis efferentia, loci sporogeni unilaterales tria septa distalia conidiophori subtenti. Basidiospora 2.3-3.8 X 3.2-5.1 µm, multi in quoque loco, sicca, hyalina, ovoidea, echinulata, non-septata, ad basim acuta.

Agaricostilbales, Basidiomycotina. *Basidiomata* reduced to fasciculate fertile hyphae which are erect, branched at the base or unbranched, colourless, finely echinulate, septate only in the upper, fertile part (the basidium) and the basal part, septa in these regions 7.2-10.5 µm apart; 155-300 µm tall, sterile part narrower, 2.3-3.2 µm wide. *Cystidia* absent. *Basidia* transversely 3-septate, each of the upper three cells 6.8-10.5 µm long, 3.8-5.0 µm wide. Basidiospore production localized, a succession of 3-7 spores developing on the same side of each of the lower 3 cells, the accumulation of sporogenous loci on each cell of the basidium forming a structure which is at first slightly raised and hump-like, and finally vesicular; this structure is found just below the upper septum of the three lower cells of the basidium. After the basidiospores have been passively shed, small scars (reduced sterigmata?) remain at the sporogenous loci. *Basidiospores* dry, colourless, ovoid, echinulate, non-septate, pointed at the base, 3.2-5.1 X 2.3-3.8 µm. Basidiospores germinating to produce yeast cells.

Habitat and type: on dead *Rhopalostylis sapida* inflorescence, Fairy Falls Track, Waitakere Ranges, Auckland, New Zealand, W.B. Kendrick, 23 January 1980 (KNZ 785).

Acknowledgements

The authors thank to Dr. G. L. Barron from Department of Environmental Biology, University of Guelph and Dr. Nag Raj from Department of Biology, University of Waterloo for the critical review of this paper.

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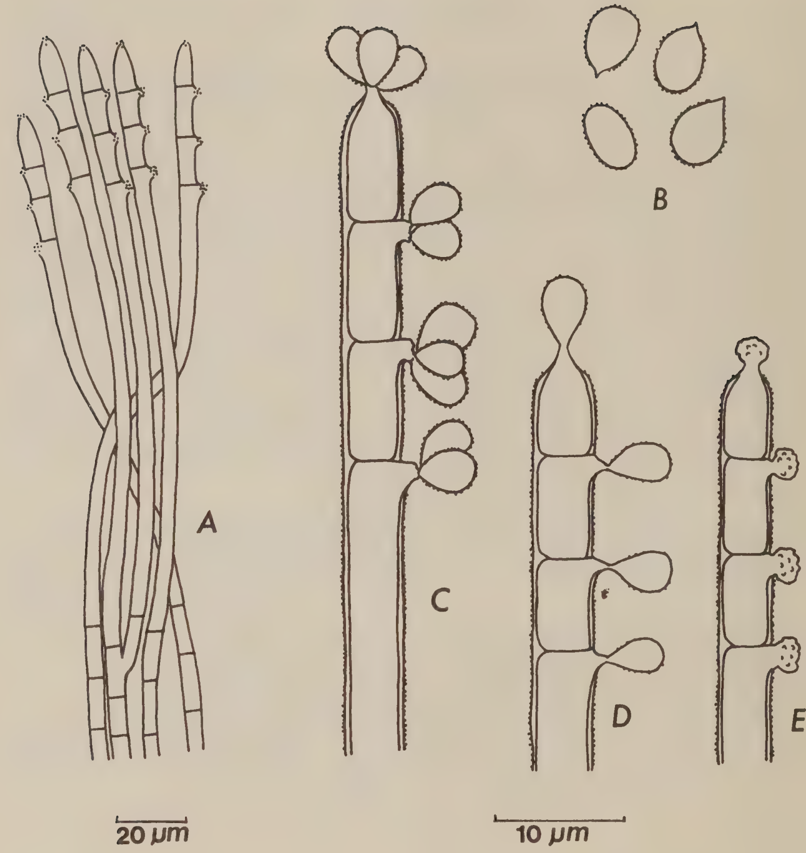
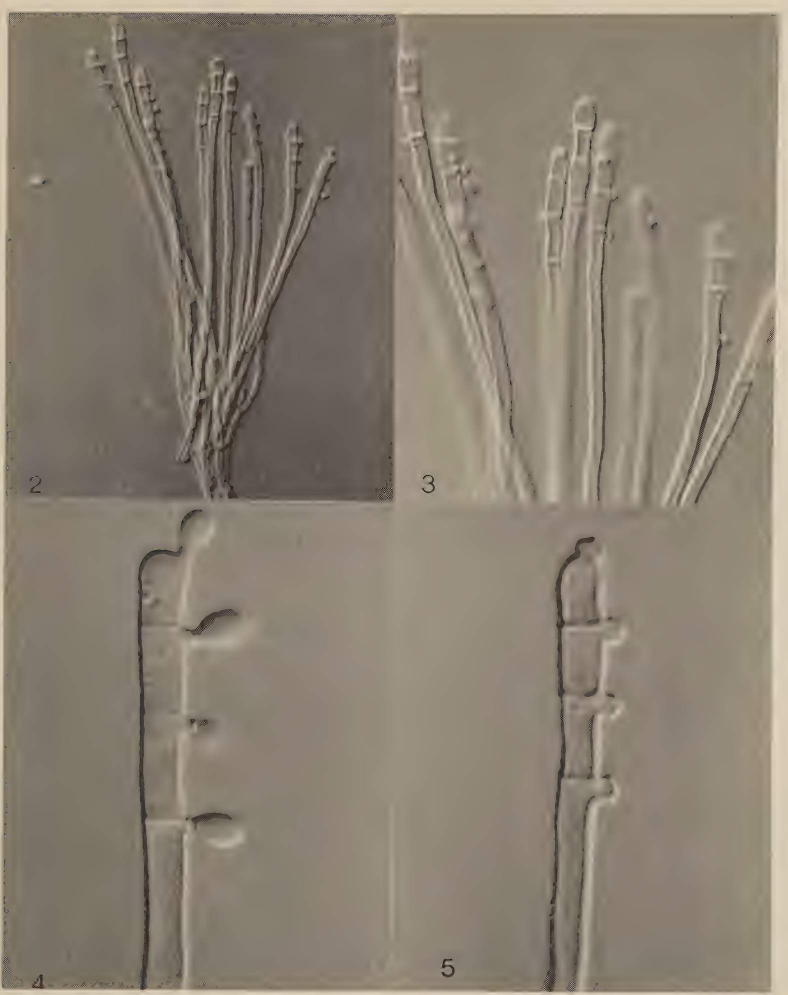


Fig.1. *Agaricostilbum nova-zelandica* sp. nov. A. fertile hyphae B. basidiospores C. D. basidia with attached basidiospores, E. basidium with vesicular outgrowths bearing reduced sterigmata.



Figs. 2-5. *Agaricostilbum nova-zelandica* sp.nov.
2. fertile hyphae, X200 3. fertile hyphae, X500
4. young basidia and basidiospores, X1250
5. mature basidia with vesicular outgrowths, X1250.

MYCOTAXON

Volume LIV, pp. 27-36 April-June 1995

NOTES ON HYPHOMYCETES. LXIV.
NEW SPECIES OF MYCOVELLOSIELLA, PHAEOISARIOPSIS, SIROSPORIUM AND STENELLA FROM INDIA

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ABSTRACT

Four previously undiscovered species of foliicolous, dematiaceous Hyphomycetes, namely *Mycovellosiella moracearum* Khan & Kamal, *Phaeoisariopsis lygodii* Khan & Kamal, *Sirosporium dendropthoes* Khan & Kamal, and *Stenella shoreae* Khan & Kamal, collected in Uttar Pradesh, India, are described, illustrated and compared with similar, previously-known taxa.

INTRODUCTION

As indicated in the immediately preceding paper of this series (Khan, Kamal and Morgan-Jones, 1993), surveys of foliicolous, anamorphic micro fungi in Uttar Pradesh have led to the discovery of considerable numbers of previously undescribed species. Collection on a wide range of hosts in the forest areas surrounding and in the vicinity of Gorakhpur and Bahraich during the past decade (Kamal *et al*., 1991; Khan *et al*.,1992) has resulted in the description of new species of the following genera; *Cercospora*, *Heteroconium*, *Mycovellosiella*, *Phaeoisariopsis*, *Phaeoramularia*, *Pseudocercospora*, *Sarcinella*, *Sirosporium* and *Stenella*. In the present contribution additional species of four of these genera are reported.

TAXONOMIC PART

Mycovellosiella moracearum Khan et Kamal sp.nov. (Figure 1)

Maculae hypophyllae, fuscae, nervis foliorum limitatae. Discolorationes epiphyllae, parvae, flavidae. Mycelium plerumque immersum vel partim superficiale, ex hyphis ramosis, septatis, pallide brunneis vel olivaceo-brunneis, laevibus, 2-3µm crassis compositum. Stromata parce formata, olivacea, ex hyphis paucis substomatalibus compositum, usque ad 6µm diametro. Conidiophora macronemata, mononemata, fasciculata, recta vel leniter curvata, saepe flexuosa, laevia, simplicia vel interdum ramosa, 1 ad 3-septata, 20-60 X 3-5.5µm. Cellulae conidiogenae in conidiophoris integratae, terminales, polyblasticae, sympodiales, cicatricatae. Cicatrices conidiales inconspicuae. Conidia acropleurogena, solitaria vel catenata, sicca, subcylindrica, recta vel curvata, laevia, pallide olivacea, usque ad 5-septata, 8-80 X 2.5-5µm.

In foliis vivis *Fici religiosae*, University Campus, Gorakhpur, Uttar Pradesh, India, December 1990, Kamal, GPU Herb. No. KS 279 holotypus, HCIO 30796 isotypus.

Leaf lesions hypophyllous, brownish, somewhat irregular in shape, limited in extent by veins. Yellowish discoloration apparent on upper leaf surface. Mycelium mostly immersed in host tissue, partly external, composed of branched, septate, pale brown to olivaceous, smooth, 2-3µm wide hyphae. Superficial hyphae emerging through stomata, repent on leaf surface. Stromata small, poorly developed, substomatal, olivaceous, up to 6µm wide. Conidiophores macronematous, mononematous, often in loose fascicles above stomata, also borne terminally and laterally on superficial hyphae, straight or slightly curved, sometimes flexuous, smooth, simple or very occasionally branched, 1 to 3-septate, 20-60 X 3-5.5µm. Conidiogenous cells integrated, terminal, polyblastic, sympodial, cicatrized. Conidial scars discernible but inconspicuous or only slightly prominent. Conidia acropleurogenous, solitary or, more rarely, catenate, dry, subcylindric or slightly obclavate, straight or curved, attenuating gradually toward the apex, smooth, pale olivaceous, up to 5-septate, obtuse to subacute at the apex, subtruncate at the base and bearing a thickened scar, 8-80 X 2.5-5µm.

On living leaves of *Ficus religiosae* L. (Moraceae); India.

Collection examined: on *F. religiosae*, University Campus, Gorakhpur, Uttar Pradesh, India, December 1990, Kamal, GPU Herb. No. KS 279, holotype, HCIO 30796 isotype.

Among most species of *Mycovellosiella* Rangel hitherto described, *M. moracearum* is distinguishable by its long, slender conidia. In this regard it somewhat resembles such species as *M. sublateritia* (P. Henn.) Deighton and *M. triumfettae* Deighton. Only two other species of the genus are known from hosts belonging to the Moraceae, namely *M. fici* Rai & Kamal and *M maclurae* (Ell. & Langl.) Deighton, which occur on *Ficus hispida* L. and *Maclura pomifera* (Raf.) Scheid., respectively. *Mycovellosiella moracearum* is quite different from both these taxa, which have much shorter conidia. Those of *M. maclurae*, the causal organism of cottony leaf spot of osage-orange in the southeastern United States are rarely up to 15um long (Deighton, 1974) and are minutely verruculose and aseptate.

Phaeoisariopsis lygodii Khan and Kamal sp.nov. (Figure 2).

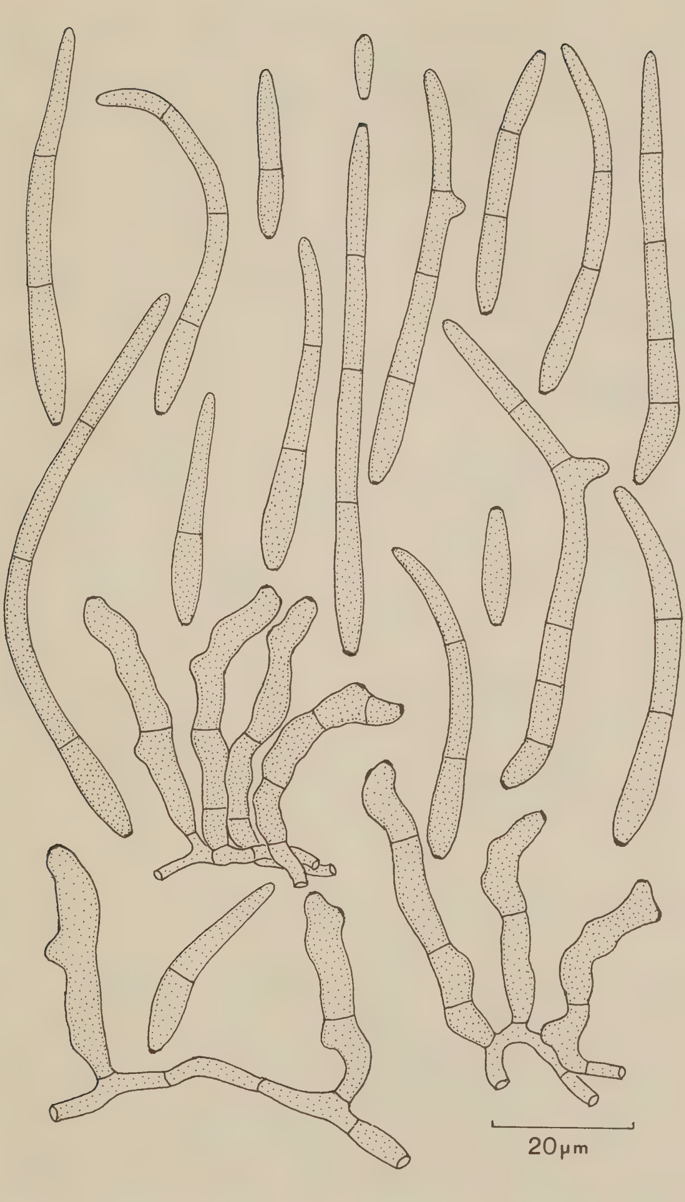

FIGURE 1. *Mycovellosiella moracearum*. Mycelium, conidiophores and conidia.

Maculae amphigenae, orbiculares vel suborbiculares, brunneae. Coloniae hypophyllae, effusae, olivaceae, floccosae. Mycelium immersum, ex hyphis ramosis, septatis, laevis, pallide brunneis, usque ad 5μm latis compositum. Stromata prosenchymatica vel pseudoparenchymatica, subepidermoidea vel substomatalia, brunnea, subglobosa, 36-40μm. Conidiophora ex cellulis superis stromatum oriunda, macronemata, mononemata, caespitosa vel fasciculata, nonramosa, recta vel flexuosa, pallide vel olivaceo-brunnes, laevia, 88-225 X 4-7μm. Cellulae conidiogenae in conidiophoris integratae, polyblasticae, terminales, sympodiales, cylindricae vel clavatae, cicatricatae. Cicatrices conidiales non incrassatae, inconspicuae, plerumque aegre perspicuae. Conidia acropleurogena, solitaria, sicca, simplicia, recta vel leniter curvata, cylindrica vel obclavata, pallide olivacea, laevia, 1 ad 12-septata, ad septa constricta, in hilum truncatum non incrassatum breviter attenuata, 38-130 X 3-6μm.

In foliis vivis *Lygodiae flexuosi*, South Gorakhpur Forest Division, Uttar Pradesh, India, December 1990, Kamal, HCIO 30794 holotypus, GPU Herb. No. KS 277 isotypus.

Leaf lesions amphigenous, orbicular or suborbicular, necrotic, dark brown. Colonies hypophyllous, effuse, olivaceous, floccose, predominantly toward and along the margins of the pinnae, discrete and more or less circular or rarely coalescing to form large somewhat irregular patches. Mycelium immersed, composed of branched, septate, smooth, pale brown, up to 5μm wide hyphae. Stromata prosenchymatous to pseudoparenchymatous, subepidermal or substomatal, brown, subglobose, 36-40μm. Conidiophores arising from the superficial cells of the stromata, macronematous, mononematous, caespitose to fasciculate, in groups of from four to twenty four, unbranched, straight or flexuous, pale to olivaceous-brown, smooth, 88-225 X 4-7μm. Conidiogenous cells integrated, polyblastic, terminal or very occasionally becoming intercalary, sympodial, cylindrical or clavate, cicatrized, with thin, inconspicuous, not easily discernible scars. Conidia acropleurogenous, solitary, dry, simple, smooth or slightly curved, cylindrical to obclavate, pale olivaceous, smooth, 1 to 12-septate, often slightly constricted at the septa, attenuating toward the base which bears an unthickened hilum, 38-130 X 3-6μm.

On living leaves of *Lygodium flexuosum* Sw. (Schizeaceae); India.

Collection examined: on *L. flexuosum*, South Gorakhpur Forest Division, December 1990, Kamal, HCIO 30794 holotype, GPU Herb. No. KS 277 isotype.

Phaeoisariopsis lygodii is broadly similar in morphology to such previously described species as *P. bataticola* (Cif. & Bruner) M.B. Ellis and *P. menispermi* (Ell. & Holway) Deighton and it resembles the latter in symptomatology, causing distinct, dark brown necrotic lesions. *Phaeoisariopsis bataticola* causes small purplish-black leaf spots on species of *Ipomoea* L. These taxa have more or less straight or slightly flexuous, narrowly obclavate conidia. Conidia in the genus *Phaeoisariopsis* vary in shape from cylindrical to fusiform to obclavate and are straight, distinctly curved, as in *P. argyreiae* Yen, Kar & Das, or somewhat sigmoid, as in *P. indica* (Subram.) Deighton. *Phaeoisariopsis lygodii* is easily distinguishable from the other species by conidial dimensions, coloration, and degree of septation. It differs from *P.*

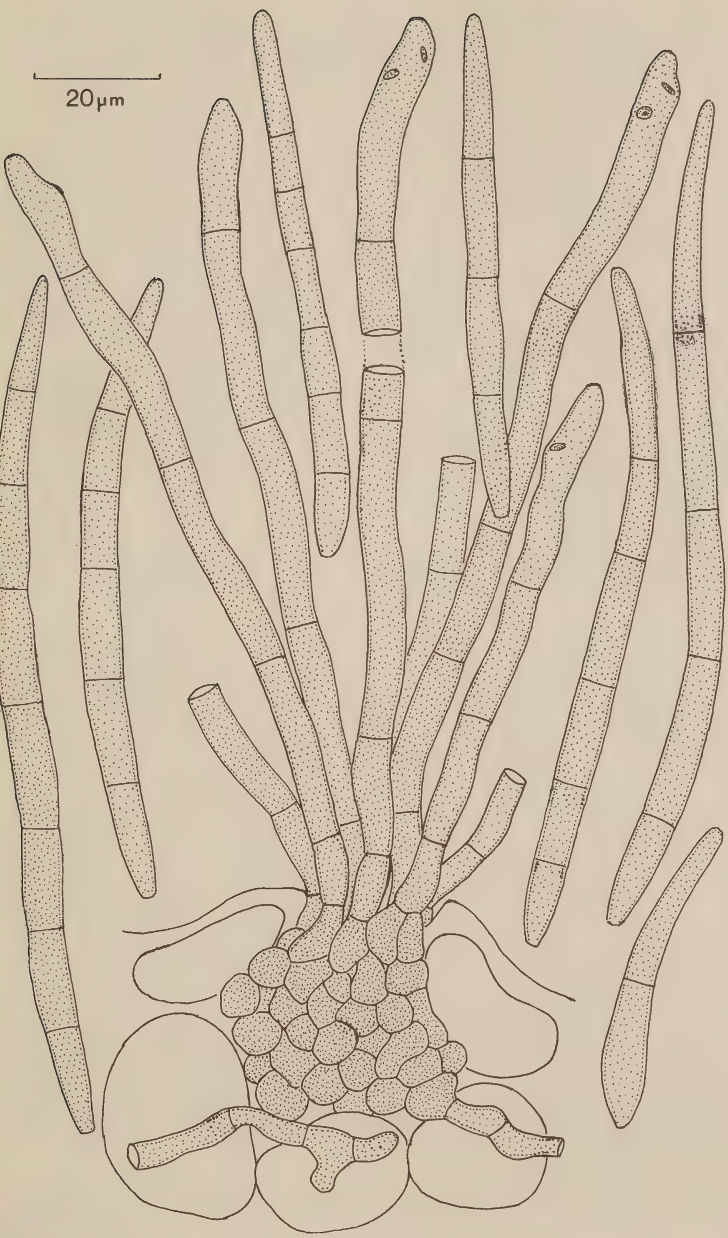

FIGURE 2. *Phaeoisariopsis lygodii.* Mycelium, stroma, conidiophores and conidia.

menispermi in having pale-olivaceous, much longer and more abundantly septate conidia, as compared to those of that species which are golden brown. It is the first taxon of its genus to be encountered on the host family Schizeaceae.

Sirosporium dendropthoes Khan et Kamal sp.nov. (Figure 3).

Coloniae amphigenae, effusae, brunneae vel nigrae, velutinae, pulvinatae, circulares vel irregulares, discretae. Mycelium immersum vel superficiale, ex hyphis ramosis, septatis, pallide brunneis, laevis, repentibus, usque ad 2µm crassis compositum. Stromata partim immersa et plerumque superficiale, parvum vel rudimentale, pseudoparenchymatica, 10-15µm crassa, ex cellulis pallide-brunneis compactis compositum. Conidiophora ex cellulis superis stromatum oriunda vel ex hyphis lateraliter et terminaliter oriunda, macronemata, mononemata, erecta vel adscendentia, non ramosa, recta vel flexuosa, cylindrica ad clavata, septata, pallide vel medio brunnea, 10-38µm longa, 2.5-4µm crassa. Cellulae conidiogenae in conidiophoris integratae, terminales, polyblasticae, sympodiales, cicatricatae. Conidia acropleurogena, solitaria, sicca, simplicia, cylindrica vel obclavata, recta vel flexuosa, leniter curvata, vermiformia, brunnea vel aurantio-brunnea, rare flavido-olivacea, phragmospora vel dictyospora, usque ad 16 septata, saepe constricta ad septa, ad basim cicatrice praedita, 6-60 X 2-5µm.

In foliis vivis *Dendropthoes falcati*, Raniapurwa, Sohelwa West Forest, Bahraich, Uttar Pradesh, India, February 1991, M.K. Kahn, HCIO 30825 holotypus, GPU Herb. No. KS 285 isotypus.

Colonies amphigenous, effuse, somewhat variable in size, brown to blackish, velvety, cushion-like when fully developed, more or less circular to irregular in shape, discrete, as isolated spots. Mycelium usually partly immersed and partly superficial, composed of branched, septate, pale brown, smooth, repent, up to 2µm wide hyphae. Stromata partly immersed, but erumpent and mostly superficial when fully developed, small or rudimentary, varying considerably in size and shape, up to 15µm wide, pseudoparenchymatous in texture and composed of pale brown compact cells. Conidiophores formed from the upper cells of the stromata or arising terminally or laterally from the repent vegetative hyphae, semi-macronematous to macronematous, mononematous, erect or ascending, unbranched, straight or slightly flexuous or curved, cylindrical to clavate, with up to three transverse septa, sometimes slightly roughened toward the apex, pale to mid brown, becoming dark brown with age, 10-38µm long, 2.5-4µm wide. Conidiogenous cells integrated, terminal, polyblastic, sympodial, irregular in shape, cicatrized. Conidia acropleurogenous, solitary, dry, simple, cylindrical or obclavate, straight to flexuous, sometimes gently curved, occasionally vermiform, brown to golden brown, rarely yellowish, brown to golden brown, rarely yellowish-olivaceous, phragmosporous or dictyosporous, with up to 16 transverse septa, sometimes with 1 to 3 oblique or longitudinal septa, quite variable in shape and size, obtuse at the apex, subtruncate at the base, often constricted at the septa, bearing a thin basal scar, 6-60 X 2-5µm.

On living leaves of *Dendropthoes falcatum* (L.) Ellings. (Loranthaceae); India.

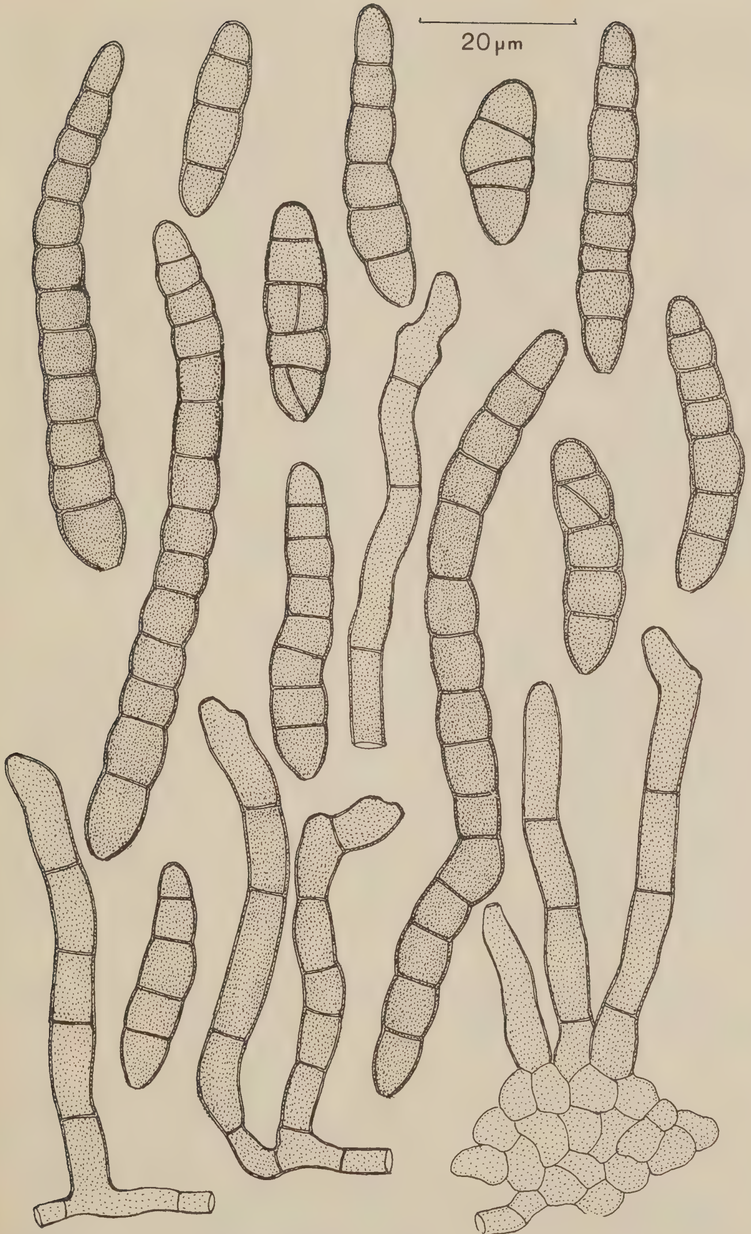

FIGURE 3. *Sirosporium dendropthoes*. Mycelium, stroma, conidiophores and conidia.

Collection examined: on *D. falcatum*, Raniapurwa, Sohelwa West Forest, Bahraich, Uttar Pradesh, India, February 1991, M.K. Khan, HCIO 30825 holotype, GPU Herb. No. KS 285 isotype.

Sirosporium dendropthoes belongs to a small group of species within the genus which form diminutive or rudimentary stromata. These include *S. carissae* Kapoor, *S. celtidicola* M.B. Ellis, *S. gliricidiae* (Syd.) Deighton, and *S. munduleae* (H. & P. Syd.) M.B. Ellis. The stromata, where present in the genus, are formed superficially, as in *S. carissae*, or partly immersed and erumpent, often through stomata, as in *S. celtidicola*. *Sirosporium dendropthoes* can readily be distinguished from these species by the morphology of its conidia, which somewhat resemble those of such species as *S. gliricidiae* (Syd.) Deighton and *S. diffusum* (Heald & Wolf) Deighton, but are more variable in shape and septation. The conidia of *S. dendropthoes* are somewhat variable in shape and form, in the manner of those of *S. antenniforme* (Berk. & Curt.) Bubak & Serebrianikow, the type species of the genus. In these taxa the conidia are either long-obclavate and phragmosporous or broad-obclavate and dictyosporous, usually bearing one to several oblique or longitudinal septa. The majority of *Sirosporium* species form their colonies hypophyllously with only a few being amphigenous. Those having the latter characteristic are *S. dendropthoes*, *S. gliricidiae*, and *S. stylidii* M.B. Ellis. No member of *Sirosporium*, other than *S. dendropthoes*, has previously been recorded as occurring on a host belonging to the Loranthaceae.

Stenella shoreae Khan et Kamal sp.nov. (Figure 4).

Maculae hypophyllae, atrobrunneae vel atrae, numerosae. Coloniae hypophyllae, effusae, floccosae, atrobrunneae vel atrae, orbiculares vel irregulares, coalescentes, usque ad 22mm diametro. Mycelium plerumque superficiale, ex hyphis septatis, ramosis, minute verruculosis, pallide brunneis, 2-3µm latis compositum. Stromata nulla. Conidiophora macronemata, mononemata, simplicia, ex hyphis superficialibus repentibus lateralia oriunda, recta vel leniter flexuosa, cylindrica, medio brunnea, parietibus crassis, apicem versus pallidiora, 60-270µm longa, 3.5-6.5µm crassa. Cellulae conidiogenae in conidiophoris integratae, polyblasticae, terminales, interdum intercalares, symopodiales, cicatricatae. Cicatrices conidiales conspicuae. Conidia solitaria vel catenulata, catenulis simplicibus, sicca, cylindrica vel obclavata, recta vel leniter curvata, septata, pallide brunnea, verruculosa, cicatrice leniter crassata praedita, 16.5-47 X 4.5-7.5µm.

In foliis vivis *Shoreae robustae*, Raniapurwa, Sohelwa West Forest, Bahraich, Uttar Pradesh, India, February 1991, M.K. Khan, HCIO 30791 holotypus, GPU Herb. No. KS 275 isotypus.

Infection lesions hypophyllous, dark brown to black, numerous and distributed more or less evenly over leaf surfaces. Colonies hypophyllous, effuse, floccose, dark brown to black, circular to somewhat irregular and occasionally coalescing, up to 22mm in diameter. Mycelium mostly superficial, composed of septate, branched, interweaving, pale brown, minutely verruculose, 2-3µm wide hyphae. Hyphae often swollen, up to 6um wide, near area of conidiophore origin. Stromata absent. Conidiophores semi-macronematous to

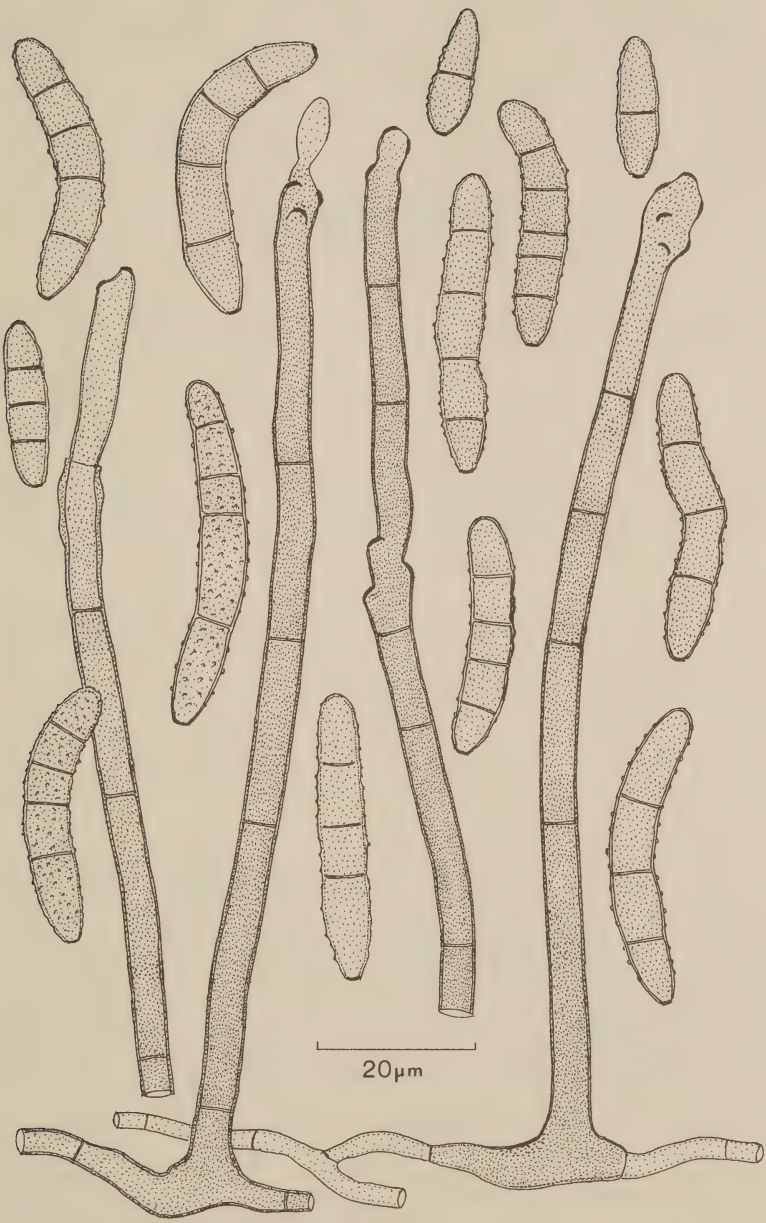

FIGURE 4. *Stenella shoreae*. Mycelium, conidiophores and conidia.

macronematous, mononematous, simple, produced laterally from superficial, repent hyphae, straight or slightly flexuous, cylindrical, medium to darkish brown when fully mature, thick-walled, somewhat paler toward the extreme apex, 60-270μm long, 3.5-6.5μm wide. Conidiogenous cells integrated, polyblastic, terminal or sometimes becoming intercalary following apical growth, conspicuous, but not appreciably thick. Conidia solitary or catenulate, chains simple, dry, cylindrical or obclavate, straight or slightly curved, 1 to 5-septate, pale brown, verruculose, obtuse at the apex and subtruncate at the base when terminal, subtruncate at each end where intercalary, bearing a slightly thickened, up to 2μm wide, scar, 16.5-47 X4.5-7.5μm.

On living leaves of *Shorea robusta* Gaertn. (Dipterocarpaceae); India.

Collection examined: on *S. robusta*, Raniapurwa, Sohelwa West Forest, Bahraich, Uttar Pradesh, India, February 1991, M.K. Kahn, HCIO 30791 holotype, GPU Herb. No. KS 275 isotype.

Among previously described species of *Stenella* Sydow, *S. shoreae* is readily distinguishable by the morphology and dimensions of its conidiophores and conidia. The conidiophores of *S. shoreae* are similar to those of such species as *S. caravaliae* (H. & P. Syd.) Deighton and *S. lythri* (Westend.) Mulder and its conidia have something of the aspect of those of *S. tristariae* Huguenin. It is the first species of the genus to be recorded on its host family.

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NOTES ON HYPHOMYCETES. LXV. NEW SPECIES OF MYCOCENTROSPORA FROM INDIA, WITH A REVIEW OF AND COMMENTS ON THE GENUS

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ABSTRACT

Two new species of *Mycocentrospora* Deighton, *M. acalyphae* K. Sriv. & A.K. Sriv. and *M. polygonii* K. Sriv. & A.K. Sriv., occurring on living leaves of *Acalypha indica* L. and *Polygonum minus* Huds., respectively, in India are described and illustrated. They are compared with other taxa and a key to foliicolous species of *Mycocentrospora* is provided. A review of the genus is offered and comments made on its current state.

INTRODUCTION

The genus *Mycocentrospora* was established by Deighton (1972) to accommodate four species, *M. acerina* (Hartig) Deighton, its type, *M. asiminae* (Ell. & Kellerm.) Deighton, *M. cantuariensis* (Salmon & Wormald) Deighton and *M. mitragynae* (Pavgi, Singh & Deighton) Deighton, originally classified in either *Centrospora* Neergaard or *Cercospora* Fresen. The generic name *Centrospora*, based on *C. ohlsenii* Neergaard, now considered a synonym of *M. acerina*, was taken up earlier by Deighton (1971) for two of these taxa, although it was then known to be a later homonym of *Centrospora* Trevisan, a brown algae. The same author (Deighton, 1970) had previously proposed the conservation of *Centrospora* Neergaard [1942] against *Centrospora* Trevisan [1845] on the mistaken assumption that the latter, although validly published, had been rejected. Silva (1972) subsequently offered reasons for retaining *Centrospora* Trevisan, pointing out that Deighton (1970) had been incorrect in his assumption. Deighton (1972) thus proposed *Mycocentrospora* as a new name for *Centrospora* Neerg. and since that time an additional nine species and one variety have been added to the genus. There is some uncertainty, however, as to the total homogeneity of *Mycocentrospora* as presently constituted.

Petersen (1962a) named an aquatic hyphomycete on decaying leaves of an unidentified species of *Prunus* L., *Centrospora angulata* Petersen. Although being broadly similar in morphology and conidium ontogeny to *Mycocentrospora acerina*, including presence of a basal conidial appendage, this fungus differs in producing only a single terminal conidium and its conidiophores do not proliferate sympodially. Another spore state, referred to as "secondary phialospores", was encountered when *C. angulata* was grown *in vitro*. These microconidia are formed from *Phialophora*-like phialides. A similar state is known to be produced by *Anguillospora pseudolongissima* (Ranzoni, 1953). Petersen (1962b) added another aquatic hyphomycete to *Centrospora* when he transferred *Anguillospora filiformis* Greathead to the genus. Ingold (1958) had earlier offered the opinion that a similar fungus, which was originally thought to be an *Anguillospora* (Ingold, 1949), was a species of *Centrospora*. *Centrospora filiformis* (Greathead) Petersen also differs from typical *Mycocentrospora* species in lacking conidiophore sympodial proliferation (Greathead, 1961). Iqbal (1971) named yet another aquatic species of *Centrospora*, *C. aquatica* Iqbal. The fungus was said to closely resemble *C. filiformis* but differ from it in having smaller, narrower, tapering conidia. Subsequently the same author (Iqbal, 1974) described *Mycocentrospora clavata* Iqbal, found on decaying branches submerged in river water. This taxon is more closely similar to *M. acerina* in that its conidiophores proliferate sympodially at least once to give rise to a second conidium. In the same publication the above mentioned *C. angulata*, *C. aquatica* and *C. filiformis* were all transferred to the genus *Mycocentrospora* as *M. angulata* (Petersen) Iqbal, *M. aquatica* (Iqbal) Iqbal and *M. filiformis* (Greathead) Iqbal, respectively. A superfluous combination, *Mycocentrospora angulata* [as *ungulata*] (Petersen) I.A. Dudka, also exists [*Ukr. bot. Zh.* 49:61, 1983].

Deighton (1971) expressed the view that it was doubtful that either *C. angulata* or *C. filiformis* was satisfactorily included in *Centrospora* but made no proposal as to their reclassification. Wolfe (1976) agreed with this contention and effectively reinstated the basionym *Anguillospora filiformis* as the appropriate binomial for the fungus described by Greathead (1961). Furthermore Wolfe (loc. cit.) proposed the new combination *Anguillospora angulata* (Petersen) Wolfe but, failing to provide full particulars of the publication of the basionym *Centrospora angulata* Petersen, the transfer was invalid. Subsequently Redhead and White (1985) validly retransferred *Centrospora angulata* into *Anguillospora* as *A. angulata* (Petersen) Redhead & White. Neither Wolfe (loc. cit.) nor Redhead and White (loc. cit.) made mention of the classification of the two fungi as species of *Mycocentrospora* by Iqbal (1974). Two of the thirteen known species of *Mycocentrospora* are thus now classified elsewhere. The status of *Mycocentrospora aquatica* remains doubtful. Wolfe (loc. cit.) suggested that it too might be better classified in *Anguillospora* but took no action in this regard. In so far that it also lacks the sympodial conidiophore typical of *Mycocentrospora*, and bearing in mind its similarity to *A. filiformis*, it would appear that a case could be made to transfer it into *Anguillospora*.

Pollack and Ellett (1974) established the binomial *Mycocentrospora verrucosa* Pollack & Ellett for a fungus causing brown lesions on living leaves of *Euonymus kiautschovica* Loes. This species differs from those typical of *Mycocentrospora* in possessing verrucose conidia and in having distinctly geniculate, abundantly septate, appreciably pigmented conidiophores where the majority of conidiogenous cells become intercalary. A reevaluation of its status is perhaps warranted. It bears some similarity to species of *Subulispora* Tubaki, such as *S. africana* (Morgan-Jones, Sinclair & Eicker) P.M. Kirk, particularly in conidiophore morphology and coloration, and its conidia are rostrate, tapering to a narrow apex. In the latter regard, however, it resembles *Mycocentrospora acerina* and it also produces dark brown chlamydospore-like cells as does that species. Conidia of *S. procurvata* Tubaki, the type species of *Subulispora*, *S. britannica* Sutton and *S. rectilineata* Tubaki, are subulate (Tubaki and Yokoyama, 1971; Sutton, 1973). Not all species of *Subulispora* have, however, subulate conidia, *S. africana*, *S. cylindrospora* P.M. Kirk and *S. minima* P.M. Kirk, being exceptions with cylindrical conidia (Kirk, 1985). The latter, which has semi-macronematous, hyaline conidiophores might be more appropriately classified in *Mycocentrospora* or possibly, together with the other taxa possessing cylindrical conidia, in a new genus. *Subulispora*, as has been the case with many dematiaceous hyphomycete genera, is now a heterogeneous entity.

A fungus originally named *Cercospora cladosporioides* Sacc. was transferred into *Mycocentrospora* by Costa (1976) but the name *Mycocentrospora cladosporioides* (Sacc.) P. Costa was not validly published since full citation of the basionym was not provided. This was rectified by Deighton (1983) who, in the same publication, named *Mycocentrospora camelliae* Deighton based on specimens described by Laundon (1970) but mistakenly identified as *Cercoseptoria theae* (Cav.) Curzi.

Sinclair and Morgan-Jones (1979) named *Mycocentrospora varians* Sinclair & Morgan-Jones from unidentified decaying leaves submerged in a stream. The conidiophores of this species do not proliferate sympodially to the extent that those of *M. acerina* typically do, only one or, at most, two conidia being produced per conidiophore. Therefore some question exists as to whether or not it is satisfactorily classified in the genus. It bears some resemblance to the former species of *Mycocentrospora* now classified in *Anguillospora* and to *A. longissima* Ingold, the type species of that genus.

Mycocentrospora fusarioides Matsushima, isolated from dead rachis of *Alsophila spinulosa* (Hook.) R. Tryon, a tree fern, in Taiwan (Matsushima, 1987) likewise may not be a true member of *Mycocentrospora*, although it has some of the essential characteristics of the genus. Two species of *Centrospora* named by Matsushima (1975) belong in other genera. *Centrospora gracilis* Matsushima was transferred as *Subulispora gracilis* (Mats.) de Hoog (de Hoog, 1985) while *C. helminthosporioides* Matsushima remains to be satisfactorily disposed. The latter, collected on dead leaves of *Podocarpus macrophyllus* (Thunb.) D. Don, has some of the characteristics of *Mycocentrospora* but undoubtedly should be classified elsewhere, perhaps in a new genus. Its conidia are quite different from those of *Mycocentrospora*, being similar to those of *Vermispora obclavata* Vasant Rao & de Hoog (Rao and de Hoog, 1986). An unnamed *Centrospora* described and illustrated by Matsushima (loc. cit.) appears quite similar to *Subulispora minima*.

Tribe and Cayrol (1982) named a variety of *Mycocentrospora acerina*, var. *castelnaudariensis* Tribe & Cayrol, encountered within cysts of the nematode *Heterodera avenae* Wollenw. It differs from the species in producing microsclerotia *in vitro*.

The fungus known as *Mycocentrospora asiminae*, one of the four species included in the genus by Deighton (1972) when it was established, has been reclassified as *Miuraea asiminae* (Ell. & Morgan) Arx & Constantinescu (von Arx, 1983). This action was presumably taken because of the occasional presence of a longitudinal or oblique septum, in addition to transverse septa, in conidia of *M. asiminae*. *Phloeospora asiminae* Ell. & Morgan [*J. Mycol.* 3:88, 1887] and *Cercospora asiminae* Ell. & Kellerm. [*J. Mycol.* 3:103, 1887] were considered to be synonyms by von Arx (loc. cit.), hence the different author citation to that of Deighton (loc. cit.). The question of whether *M. asiminae* is best classified in *Miuraea* or *Mycocentrospora* is beyond the scope of the present paper but it is included in the key to the latter. The genus *Rhopaloconidium* Petrak (Petrak, 1952) has as its type species *R. asiminae* (Ell. & Morgan) Petrak. Should this species still be considered a good *Mycocentrospora* some further nomenclatural changes would be required since *Rhopaloconidium* predates *Mycocentrospora* by twenty years.

The remaining species of *Mycocentrospora*, *M. veratri* (Peck) U. Braun, was added to the genus by Braun (1991). It had originally been classified in *Cercosporella*, as *C. veratri* Peck. This taxon has rostrate conidia, similarly shaped to those of *C. acerina*. The circumscription of *Mycocentrospora* remains to be definitively decided but appears to be best restricted to plant pathogenic species bearing semi-macronematous conidiophores, often arranged in fascicles.

In the process of conducting a survey of foliicolous hyphomycetes at Gorakhpur and its vicinity two species of *Mycocentrospora* which are believed to be previously undiscovered have been collected. They are described and illustrated herein.

TAXONOMIC PART

Mycocentrospora acalyphae K. Srivastava et A.K. Srivastava sp.nov. (Figure 1).

Maculae amphigenae, irregulariter suborbiculares vel ellipticae, pallide olivaceae, usque ad 5mm latae; deinde coalescentes, usque ad 20mm latae, brunneae. Coloniae hypophyllae, effusae, pallide olivaceae vel brunneae. Mycelium immersum vel superficiale, ex hyphis hyalinis vel subhyalinis, septatis, ramosis, laevibus, usque ad 3µm crassis compositum. Hyphae saepe in

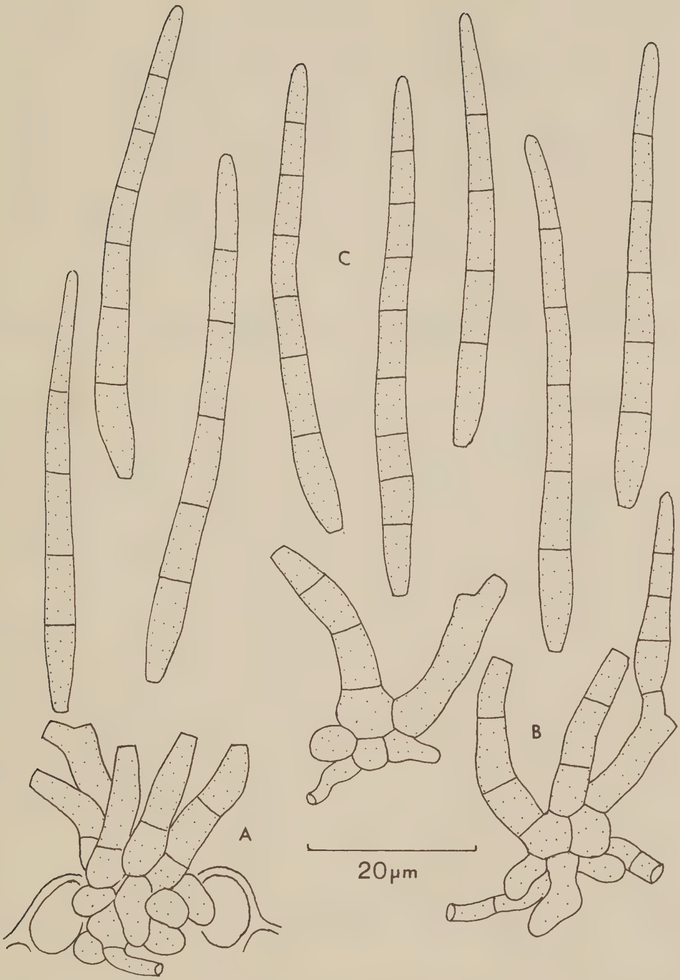

FIGURE 1. *Mycocentrospora acalyphae*. A, Conidiophores originating from stomatal stroma; B, conidiophores originating from superficial hyphae; C, conidia.

cavitas substomatales laxe aggregatae. Stromata nulla vel rudimentale, ex hyphis toruloso, inflatis, compactis compositum; substomatalia. Conidiophora micronemata vel semimacronemata, mononemata, ex cellulis superis stromatum oriunda vel ex hyphis lateraliter et terminaliter oriunda, recta vel flexuosa, simplicia, cylindrica, septata, laevia, hyalina vel pallide olivacea, 0 ad 2-septata, raro ad apicem geniculata, 11-25µm longa, 2.5-4µm crassa. Cellulae conidiogenae in conidiophoris integratae, terminales, polyblasticae, sympodiales, cicatricatae; cicatrices conidiales conspicuae, planae, latae, non incrassatae. Conidia acropleurogena, solitaria, sicca, simplicia, plerumque recta vel leniter curvata, cylindrica vel obclavata, non constricta, subhyalina, laevia, 4 ad 9-septata, ad basim truncata, ad apicem obtusa, 30-95 X 2-3µm; cellula basali in hilum non incrassatum parce attenuata.

In foliis vivis *Acalyphae indicae*, Gorakhpur, Uttar Pradesh, India, August 1991, N. Srivastava, GPU Herb. No. AK1802 holotypus, HCIO 30922 isotypus.

Leaf lesions amphigenous, somewhat irregular in shape from suborbicular to elliptical, at first discrete, pale olivaceous, up to 5mm wide; later often coalescing to form large, more or less circular, brown patches, up to 20mm wide. Colonies hypophyllous, effuse, pale olive to brown. Mycelium immersed or superficial, composed of hyaline to subhyaline, septate, branched, smooth, up to 3 µm wide hyphae. Hyphae sometimes aggregated in substomatal cavities. Stromata absent or rudimentary and poorly developed, formed of somewhat torulose, inflated, compact hyphae; substomatal or, more rarely, superficial. Conidiophore micronematous to semimacronematous, mononematous, originating from cells of the stromata or laterally and terminally from hyphae, straight or slightly flexuous, simple, cylindrical, septate, hyaline to pale olivaceous, 0 to 2-septate, rarely geniculate toward the apex, 11-25µm long, 2.5-4µm wide. Conidiogenous cells integrated, terminal, polyblastic, sympodial, cicatrized; conidial scars conspicuous, flat, broad, unthickened. Conidia acropleurogenous, solitary, dry, simple, mostly straight or very slightly curved, cylindrical to narrowly obclavate, unconstricted, subhyaline, smooth, 4 to 9-septate, truncate at the base, obtuse at the apex, 30-95 X 2-3µm; attenuating slightly toward the base which bears an unthickened hilum.

On living leaves of *Acalypha indica* L.; (Euphorbiaceae) India.

Collection examined: on *A. indica*, Gorakhpur, Uttar Pradesh, India, August 1991, N. Srivastava, GPU Herb. No. AK 1802 holotype, HCIO 30922 isotype.

Mycocentrospora acalyphae differs from all other species of *Mycocentrospora* hitherto described in the dimensions of its conidiophores and conidia. In having rather short conidiophores it resembles *M. veratri* (Peck) Braun but its conidia differ from those of that taxon in being longer and narrower. Similarly, *M. acalyphae* can be distinguished from *M. mitragynae*, a species of which it is morphologically reminiscent and the only member of this genus previously known from India, in possessing more slender conidia.

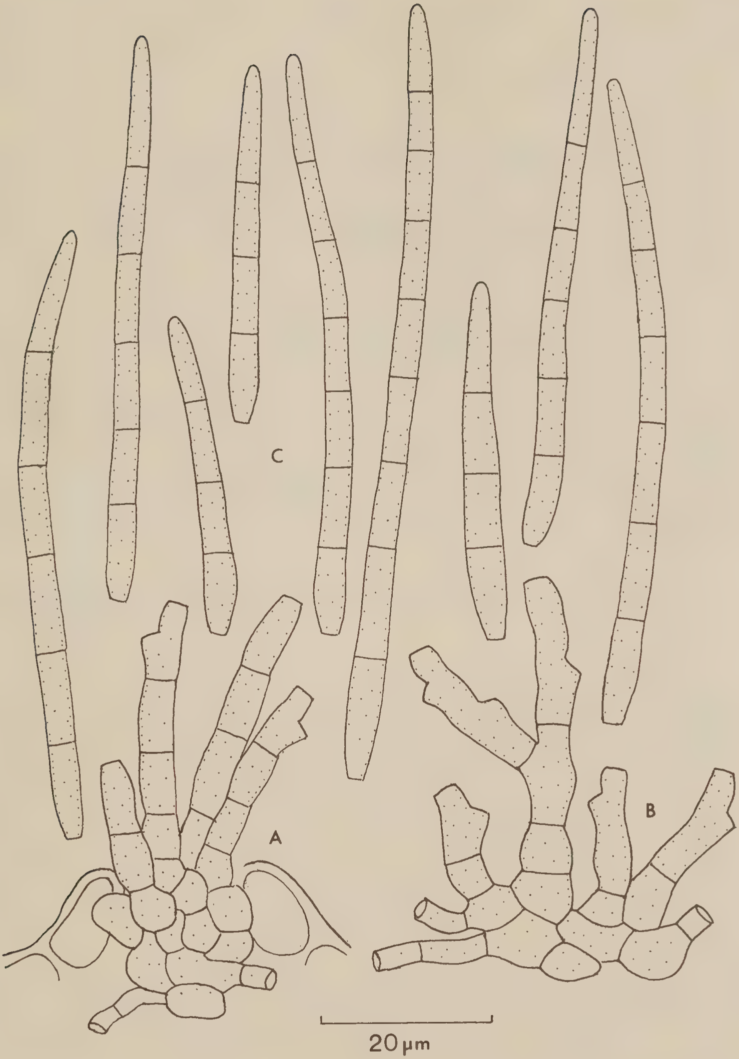

FIGURE 2. *Mycocentrospora polygonii*. A, Conidiophores originating from stomatal stroma; B, conidiophores originating from superficial hyphae; C, conidia.

Mycocentrospora acalyphae is the only species of its genus known to occur on the Euphorbiaceae.

Mycocentrospora polygonii K. Srivastava et A.K. Srivastava sp.nov. (Figure 2).

Maculae amphigenae, suborbiculares, parvae, discretae, flavidae, 1-3mm latae; deinde coalescentes, usque ad 30mm latae, brunneae, margine flavo. Coloniae hypophyllae, effusae, pallide olivaceae vel brunneae. Mycelium immersum vel superficiale, ex hyphis hyalinis, septatis, ramosis, laevibus, usque ad 2μm crassis compositum. Stromata nulla vel parva, ex hyphis toruloso, inflatis, compactis compositum; substomatalia vel suprastomatalia. Conidiophora semimacronemata, mononemata, plerumque ex cellulis superis stromatum oriunda vel ex hyphis superficialibus, torulosis, lateraliter oriunda, recta vel flexuosa, simplicia vel ramosa, cylindrica, septata, laevia, hyalina vel pallide olivacea, 0 ad 4-septata, saepe ad apicem geniculata, 10.5-42μm longa, 3-5μm crassa. Cellulae conidiogenae in conidiophoris integratae, terminales, polyblasticae, sympodiales, cicatricatae; cicatrices conidiales conspicuae, planae, latae, non incrassatae. Conidia acropleurogena, solitaria, sicca, simplicia, plerumque recta vel leniter curvata, cylindrica vel obclavata, non constricta, subhyalina, laevia, 3 ad 12-septata, ad basim truncata, ad apicem obtusa, 30-170 X 2.5-3.5μm; cellula basali in hilum, non incrassatum parce attenuata.

In foliis vivis *Polygonii mini*, Kusumi Forest, Gorakhpur, Uttar Pradesh, India, May 1992, N. Srivastava, GPU Herb. No. AK 2030 holotypus, HCIO 30864 isotypus.

Leaf lesions amphigenous, at first very small, suborbicular, discrete, yellowish, 1-3mm wide; later coalescing to form large, irregular, brown patches, up to 30mm wide, with a yellow margin. Colonies hypophyllous, effuse, pale yellow-olivaceous to brownish. Mycelium immersed or superficial, composed of hyaline, septate, branched, smooth, up to 2μm wide hyphae. Stromata absent or small and poorly-developed, made up of torulose, inflated, compact hyphae aggregated within substomatal cavities or above stomata on the leaf surface. Conidiophores semimacronematous, mononematous, originating for the most part from outer cells of stromata or laterally from torulose, superficial hyphae, straight or slightly flexuous, simple or branched, cylindrical, septate, smooth, hyaline to pale olivaceous, 0 to 4-septate, often somewhat geniculate toward the apex, 10.5-42μm long, 3-5μm wide. Conidiogenous cells integrated, terminal, polyblastic, sympodial, cicatrized; conidial scars conspicuous, flat, broad, unthickened. Conidia acropleurogenous, solitary, dry, simple, mostly straight or slightly curved, cylindrical to narrowly obclavate, unconstricted, subhyaline, smooth, 3 to 12-septate, truncate at the base, obtuse at the apex, 30-170 X 2.5-3.5μm; attenuating gradually toward the base which bears an unthickened hilum.

On living leaves of *Polygonum minus* Huds. (Polygonaceae); India.

Collection examined: on *P. minus*, Kusumi Forest, Gorakhpur, Uttar Pradesh, India, May 1992, N. Srivastava, GPU Herb. No. AK 2030 holotype, HCIO 30864 isotype.

Mycocentrospora polygonii is clearly distinct from previously described species of the genus in the morphology and dimensions of its conidiophores and conidia. Among species possessing conidia exceeding 100um in length, those of *M. polygonii* are more slender than the others, with the exception of *M. camelliae* Deighton. Conidia of the latter are of a different shape to those of *M. polygonii*, being appreciably curved and whip-like (Laundon, 1970).

KEY TO FOLIICOLOUS SPECIES OF MYCOCENTROSPORA

	Conidia distinctly rostrate	1
	Conidia cylindrical to narrowly obclavate	3
1.	Conidia verrucose, conidiophores pale brown, abundantly septate	*verrucosa*
	Conidia smooth, conidiophores hyaline, sparsely septate or aseptate	2
2.	Conidia usually more than 150µm long	*acerina*
	Conidia not more than 70 µm long	*veratri*
3.	Not causing leaf spots	*mitragynae*
	Causing necrotic leaf spots	4
4.	Conidia slender, up to 5µm thick	5
	Conidia more than 5µm thick	8
5.	Conidiophores less than 30µm long	*acalyphae*
	Conidiophores more than 30µm long	6
6.	Conidia less than 70µm long	*cladosporioides*
	Conidia more than 70µm long	7
7.	Conidia whip-like, appreciably curved	*camelliae*
	Conidia more or less straight or slightly curved	*polygonii*
8.	Conidia less than 100µm long	9
	Conidia more than 100µm long	*cantuariensis*
9.	Conidiophores 20µm long or less	*veratri*
	Conidiophores up to 40µm long	*asiminae*

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We thank the Head, Department of Botany, University of Gorakhpur, for use of facilities. Dr. J. Leland Crane, Center for Biodiversity, Illinois Natural History Survey, reviewed the manuscript, for which we are grateful.

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NOTES ON HYPHOMYCETES. LXVI.
TWO NEW RAMULARIA SPECIES FROM INDIA

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ABSTRACT

Two novel species of *Ramularia* Unger, *R. cissampeloides* N. Sriv. & Kamal and *R. triumfettae* N. Sriv. & Kamal, collected in India on living leaves of *Cissampelos pareira* L. and *Triumfetta rhomboidea* Jacq., respectively, are described and illustrated. They belong to a group of taxa having *Mycovellosiella*-like, superficial hyphae and conidiophores.

INTRODUCTION

In recent years Braun (1988, 1990a, 1990b, 1991, 1994) has reevaluated the taxonomy and nomenclature of a range of foliicolous, phytopathogenic hyphomycetes, describing many new species and reclassifying others. During the course of this work generic concepts were reviewed and changes made based on more precise circumscription of a number of taxa, particularly *Ramularia* Unger and related genera. The genus *Ramularia* has had a rather complex history and several concepts have been advanced with the result that its application and delimitation have, over the years, been unstable. Not only that, its typification has been the subject of differing opinions. Clements and Shear (1931) proposed that *Ramularia urticae* Ces. be considered its type species, rather than one of the two original species, *R. pusilla* Unger and *R. didyma* Unger (Unger, 1833). Von Arx (1970, 1983) chose *R. didyma* as the type species but Braun (1988) proposed the lectotypification of *R. pusilla* and its recognition as the type species according to the intention of Unger (1836), which was followed by Corda (1842). A broad concept of *Ramularia* is now favored by Braun (1990b), with taxa previously classified in such separate genera as *Acrotheca* Fuckel, *Didymaria* Corda, *Ophiocladium* Cav., *Ovularia* Sacc., *Pseudovularia* Speg., *Septocylindrium* Bon. ex Sacc., and *Tretovularia*

Deighton included within it. The genus *Didymaria* was based on *R. didyma*. The main distinction between *Ovularia* and *Ramularia* lies in the lack of conidium septation in the former, conidial shape and presence or absence of catenation. Initially *Ovularia* was limited to taxa bearing ovoid conidia, produced solitarily (Saccardo, 1880) but later species with conidia borne in chains were also accommodated in the genus (Saccardo, 1886). A range of intermediates exist between *Ramularia* and *Ovularia* (Hughes, 1949; Braun, 1988; Sutton and Waller, 1988), hence the two are now amalgamated.

During the course of collecting foliicolous, phytopathogenic hyphomycetes in northern India two species of *Ramularia* believed to be previously unknown were encountered. They are described and illustrated herein.

TAXONOMIC PART

Ramularia cissampeloides N. Srivastava & Kamal sp. nov. (Figure 1).

Maculae amphigenae, angulares, interdum venis limitatae, primo parvae, deinde irregulariter magnae, flavido-viridae, usque ad 12mm latae. Coloniae hypophyllae, effusae, albo-viridae. Mycelium immersum et superficiale, ex hyphis ramosis, septatis, laevis, hyalinis, usque ad 4µm crassis compositum. Conidiophora micronemata vel semi-macronemata, mononemata, solitaria ex hyphis superficialibus lateralia vel terminalia oriunda, erecta, leniter flexuosa, simplicia vel interdum ramosa, cylindrica, septata, laevia, hyalina, 20-86 X 2.5-4.5µm. Cellulae conidiogenae integratae, terminales vel raro intercalares, polyblasticae, sympodiales, saepe geniculatae et inflatae, cicatricatae; cicatrices conidiales conspicuae, incrassatae. Conidia holoblastica, acropleurogena, cylindrica vel fusiformia, 0 ad 4-septata, hyalina, laevia, recta vel leniter curvata, catenata, catenis plerumque simplicibus vel raro ramosis formata, hila leniter incrassata, 18-41 X 2.5-4.5µm.

In foliis vivis *Cissampelos pareirae*, Gorakhpur, Uttar Pradesh, India, September 1991, N. Srivastava, GPU Herb. No. 1808, holotypus; HCIO 30854, isotypus.

Leaf lesions amphigenous, more or less angular, often limited by veins, at first mostly small, discrete, becoming irregularly larger, occasionally confluent, greenish-yellow above, whitish-green below, up to 12mm wide. Colonies hypophyllous, effuse, whitish-green. Mycelium immersed or superficial, composed of branched, septate, smooth, hyaline, up to 4µm wide hyphae; secondary external hyphae tending to be abundant, distantly septate. Conidiophores micronematous to semi-macronematous, mononematous, solitary, arising terminally or laterally from superficial hyphae, semi-erect to erect, slightly flexuous, simple or very occasionally branched, cylindrical, septate, smooth, hyaline, 20-86 X 2.5-4.5µm. Conidiogenous cells integrated, terminal or, very rarely, intercalary, polyblastic, sympodial, often somewhat geniculate, sometimes slightly inflated, cicatrized, bearing thickened conidial scars. Conidia holoblastic, acropleurogenous, cylindrical to somewhat fusiform, 0 to 4-septate, hyaline, smooth, straight or very slightly curved, catenate, in simple or,

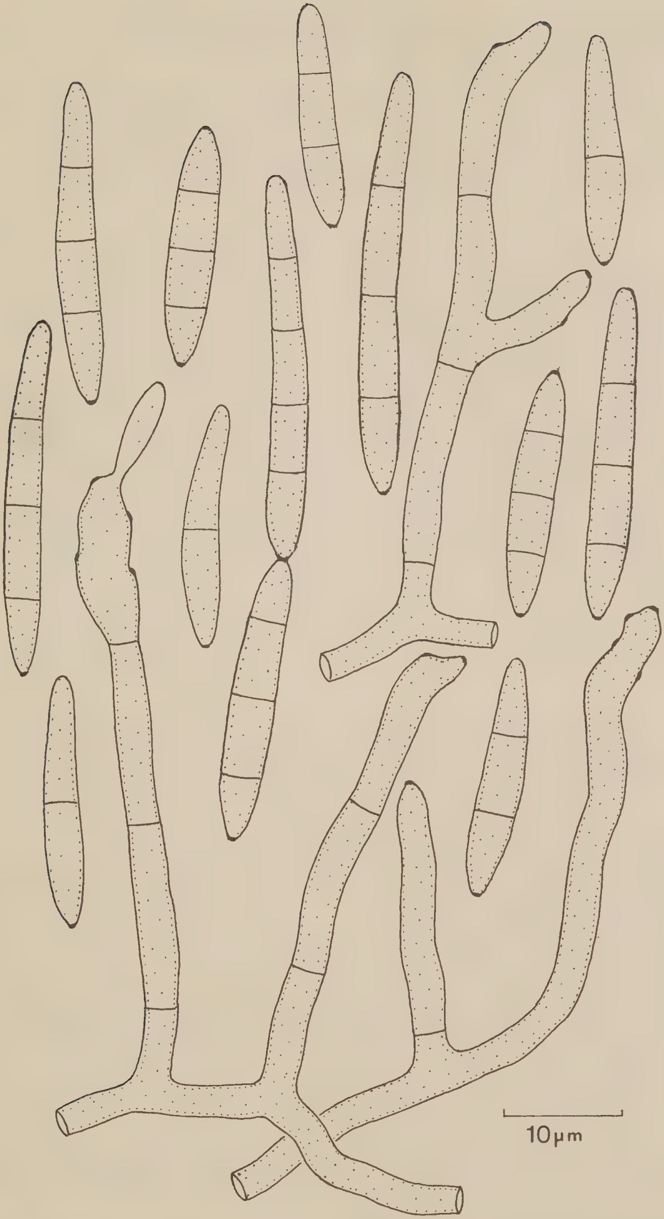

FIGURE 1. *Ramularia cissampeloides*. Superficial hyphae, conidiophores and conidia.

extremely rarely, in branched chains, attenuating gradually toward the apex and base, bearing thickened scars, 18-41 X 2.5-4.5 µm.

On living leaves of *Cissampelos pareira* L. (Menispermaceae); India.

Collection examined: on *C. pareira*, Gorakhpur, Uttar Pradesh, India, September 1991, N. Srivastava, GPU Herb. No. 1808, holotype; HCIO 30854, isotype.

Ramularia triumfettae N. Srivastava & Kamal sp. nov. (Figure 2).

Maculae amphigenae, angulares, venis limitatae, primo parvae, plerumque circa 3mm latae, flavido-viridae ad inferne flavido-albae, deinde coalescentes et irregulariter magnae, pallide brunneae vel brunneae, usque ad 20mm latae. Coloniae hypophyllae, effusae, flavido-albae vel pallide brunneae. Mycelium immersum et superficiale, ex hyphis ramosis, septatis, laevis, hyalinis, usque ad 3µm crassis compositum. Conidiophora micronemata vel semi-macronemata, mononemata, solitaria, ex hyphis superficialibus lateralia et terminalia oriunda, erecta, leniter flexuosa, simplicia, cylindrica, septata, laevia, hyalina 13-32 X 3-4µm. Cellulae conidiogenae intergratae, terminales, polyblasticae, sympodiales, saepe geniculatae, cicatricatae; cicatrices conidiales conspicuae, incrassatae. Conidia holoblastica, acropleurogena, cylindrica vel fusiformis, 0 ad 4-septata, hyalina, laevia, recta vel leniter curvata, catenata, catenis simplicibus vel ramosis, hila leniter incrassata, 12-34 X 2-4µm.

In foliis vivis *Triumfettae rhomboideae*, Gorakhpur, Uttar Pradesh, India, August 1991, N. Srivastava, GPU Herb. No. 1863, holotypus; HCIO 30916, isotypus.

Leaf lesions amphigenous, angular, often limited by veins, at first small, up to 3mm wide, greenish-yellow above, whitish-yellow below; later spreading and coalescing, becoming up to 20mm wide, irregularly shaped, brownish above, pale brown below. Colonies hypophyllous, effuse, pale yellowish to pale brown. Mycelium primarily immersed, partly superficial, composed of branched, septate, smooth, hyaline, up to 3µm wide hyphae; secondary external hyphae abundant, distantly septate. Conidiophores micronematous to semi-macronematous, mononematous, solitary, arising terminally or laterally from superficial hyphae, semi-erect to erect, straight to slightly flexuous toward the apex, unbranched, cylindrical, sparsely septate, smooth, hyaline, 13-32 X 3-4µm. Conidiogenous cells integrated, terminal, polyblastic, sympodial, cicatrized, bearing up to six thickened conidial scars. Conidia holoblastic, acropleurogenous, cylindrical to broadly fusiform, 0 to 4-septate, hyaline, smooth, straight or slightly curved, catenate, in single or branched chains, attenuating gradually toward each end, bearing thickened scars, 12-34 X 2-4µm.

On living leaves of *Triumfetta rhomboidea* Jacq. (Tiliaceae); India.

Collection examined: on *T. rhomboidea*, Gorakhpur, Uttar Pradesh, India, August 1991, N. Srivastava, GPU Herb. No. 1863, holotype; HCIO 30916, isotype.

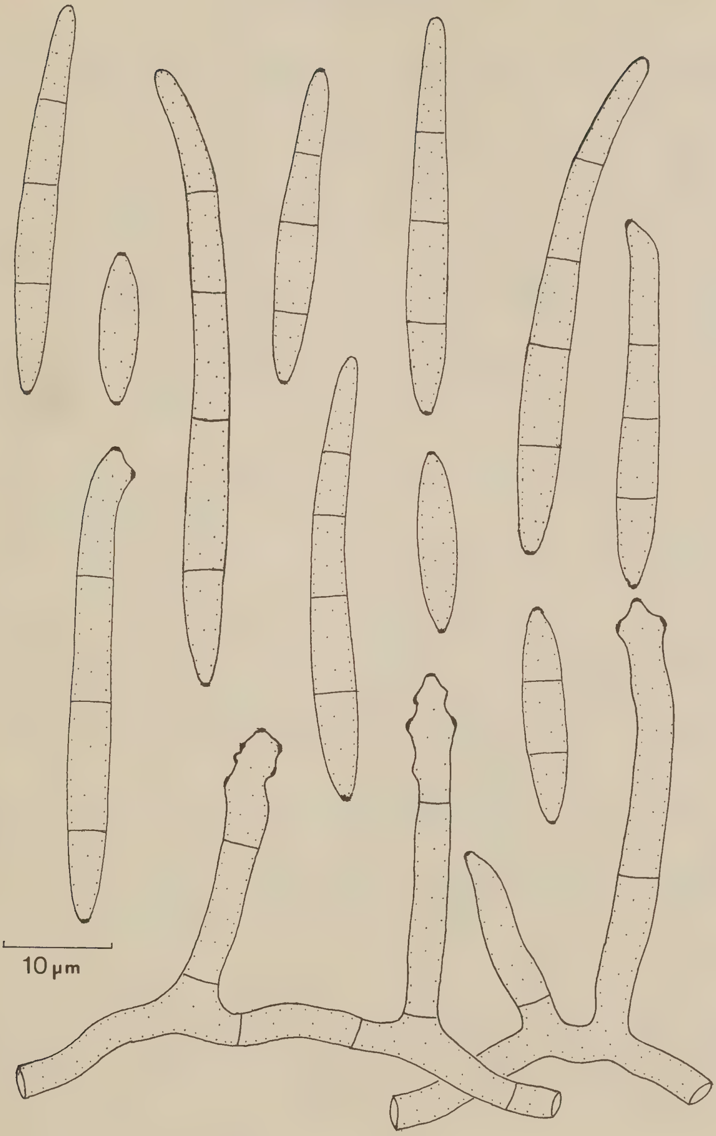

FIGURE 2. *Ramularia triumfettae.* Superficial hyphae, conidiophores and conidia.

DISCUSSION

Both *R. cissampeloides* and *R. triumfettae* belong to a group of species, characterized by lack of stromata, that produce their conidiophores solitarily from superficial hyphae rather than in fascicles. In this regard they bear resemblance to species of *Mycovellosiella* Rangel but differ from taxa classified in that genus by having hyaline conidiophores and conidia. Braun (1990a) discussed the relationship of various *Ramularia*-like hyphomycetes, bearing extensive external secondary mycelium and conidiophores arising as terminal or lateral branches of superficial hyphae, with similar pigmented species of *Mycovellosiella*. Braun (1988) had previously not included such taxa in his revised concept of *Ramularia* although other authors, such as von Arx (1983) made provision for these entities within their circumscriptions of the genus. Deighton (1974, 1979), in contrast, reclassified some *Ramularia* species bearing superficial hyphae in *Mycovellosiella*. Arguments were presented by Braun (1990a) for the inclusion of hyaline *Mycovellosiella*-like species in *Ramularia*. The notion of establishing a new genus to accommodate such fungi was considered to be untenable and the view expressed that possession of superficial hyphae was insufficient reason for segregation from *Ramularia*.

Braun (1990a) listed eight species as belonging to this complex, namely *R. cardui-personatae* Hohn., *R. maclurae* (Ell. & Langl.) U. Braun, *R. malvastri* Linder, *R. oryzae* Deighton & Shaw, *R. paspali* (Deighton) U. Braun, *R. phaseoli* (Drum.) Deighton, *R. sidae* Olive, and *R. sidarum* Petr. & Syd. Of these, excepting *R. cardui-personatae* and *R. maclurae*, six had been classified previously by Deighton (loc. cit.) in *Mycovellosiella*. These hyaline species are essentially intermediate forms between *Mycovellosiella* and *Ramularia* but the superficial hyphae are not necessarily considered the equivalent of those of the former genus, even though there is little to distinguish them morphologically. In conidiophore structure, and in conidiophore and conidial scar characteristics, these taxa are typical members of *Ramularia*. The generic concept adopted by Braun (1990a, 1990b) is accepted herein.

Some other species of *Ramularia*, such as *R. grewiae* Lacy & Thirumalachar and *R. gymnematis* Ramakrishnan & Sundaram, do not produce stromata and bear solitary, superficial conidiophores (Thirumalachar and Lacy, 1951; Ramakrishnan and Sundaram, 1954). These species resemble those mentioned by Braun (1990a) and those described in this paper. Another similar species, *R. piperis* P. Henn., was transferred into *Mycovellosiella* as *M. piperis* (P. Henn.) U. Braun on account of its having faintly pigmented conidiophores and conidia (Braun, 1991).

The two species described in this paper appear to differ in a number of respects from those previously described, in addition to having separate host family distinction. Morphologically they are similar to *R. cardui-personatae* and *R. gymnematis* but can be distinguished from these species by conidiophore and conidial size, as well as degree of septation.

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NOTES ON HYPHOMYCETES. LXVII.
THREE NEW SPECIES OF PHAEORAMULARIA FROM NEPAL

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ABSTRACT

Three new species of *Phaeoramularia* Muntañola, *P. clematidis* S.K. Singh & R.K. Chaudhary, *P. nepalensis* S.K. Singh & R.K. Chaudhary, and *P. pyricola* S.K. Singh & R.K. Chaudhary, collected in Nepal on living leaves of *Clematis gouriana* Roxb., *Eupatorium adenophorum* L., and *Pyrus communis* L., respectively, are described and illustrated. They are compared with other morphologically similar species, particularly those occurring on the same host genus or family.

INTRODUCTION

The generic name *Phaeoramularia* Muntañola was established for four species, two of which had previously been classified in *Cercospora* Fres., and two described as new (Muntañola, 1960). The type species, *Phaeoramularia gomphrenicola* (Speg.) Muntañola, a fungus occurring on living leaves of *Gomphrena glauca* (Spreng.) Moq. [= *Pfaffia glomerata* (Spreng.) Pederson] in Argentina, had originally been named *Cercospora gomphrenicola* Speg. (Spegazzini, 1882). The second species transferred from *Cercospora*, *Phaeoramularia unamunoi* (Castellani) Muntañola [≡ *Cercospora unamunoi* Castellani], is now considered a synonym of *Phaeoramularia capsicicola* (Vassiljevsky) Deighton [≡ *Cercospora capsicicola* Vassiljevsky] (Deighton, 1976; Ellis, 1976). The binomial *Phaeoramularia unamunoi* was not, in fact, validly published since Muntañola (loc. cit.) failed to cite details of basionym publication. Sutton (1970) added *Phaeoramularia maculicola* (Rom. & Sacc.) Sutton [≡ *Torula maculicola* Rom. & Sacc.] to the genus, followed by Marasas and Bredell (1974) and Matsushima (1975) who named new species; *P. kellermania* Marasas & Bredell and *P. hachijoensis* Matsushima, respectively.

Phaeoramularia remained, however, a relatively small genus for well over a decade after its establishment until twenty one additional species were added (Ellis, 1976), all but one authored, as new combinations, by F.C. Deighton and all but three previously classified, at one time or other, in *Cercospora*. Since then a plethora of taxa have been included in the genus by many authors. It now contains in total, to our knowledge, seventy-four species, not including those described herein. Of these, thirty-two were at first classified in *Cercospora*. Others were originally placed in such genera as *Fusicladium* Link, *Passalora* Fr., *Ragnhildiana* Solheim [= *Mycovellosiella* Deighton], *Selenosporium* Corda [= *Fusarium* Link : Fr.], *Septocylindrium* Bon., *Septosporium* Corda, as well as two in *Torula* Pers. : Fr. Since its inception thirty-one new species have been described in the genus. Authors who have added several further species include Deighton (1979), Liu and Guo (1982) and, more recently, Braun (1992, 1993) and Braun and Rogerson (1993). Most species of *Phaeoramularia*, as is the case with those of other genera of the large *Cercospora*-complex, are closely similar to each other, being distinguished only by a combination of small morphological distinctions, conidiophore and conidial size differentials, and host relationships. Although some doubt can perhaps be cast on the validity of a partly host-based classification most, if not all, of the species currently recognized seem to be distinct and separate entities. If and when the genus is monographed it seems possible that some synonymies may, however, become evident.

Phaeoramularia is rather close to *Cladosporium* Link:Fr., both, together with a number of other similar genera, being anamorphs of *Mycosphaerella* Johans. (von Arx, 1983). They differ in that the conidiophores of the former are not, in general, macronematous to the extent that those of most species of *Cladosporium* are and have a less well-defined fertile region. Those of *Phaeoramularia* usually arise from distinct, pseudoparenchymatous stromata produced in leaf substomatal cavities and, as a result, are arranged in dense fascicles rather than mostly solitarily as they tend to be in *Cladosporium*. Although conidium production and conidiophore and conidial scar characteristics are essentially identical in the two genera the conidia of *Phaeoramularia* are different in being much longer and slenderer, although there are a few exceptions. As discussed by Deighton (1979), some overlapping is found among many genera of this complex, each being distinguished on the basis of only one or at most a few characters which appear to be constant.

A number of species of *Phaeoramularia* have been described or recorded from the Indian subcontinent (Dublish and Singh, 1977; Patil and Thife, 1977; Kumar and Kamal, 1980; Gupta *et al.*, 1981; Mukerji *et al.*, 1983; Kamal and Naryan, 1986; Budathoki *et al.*, 1989; Kamal *et al.*, 1990; Moses and Chaudhary, 1990; Mehrotra and Verma, 1991; Rao and Yadav, 1991). During the past two decades fourteen new species, causing leaf spot symptoms on a variety of host plants, have been described from the region. In the present paper three further novel taxa are described and illustrated based on collections made in Nepal from November 1993 to January 1994.

TAXONOMIC PART

Phaeoramularia clematidis S.K. Singh et R.K. Chaudhary sp. nov. (Figure 1).

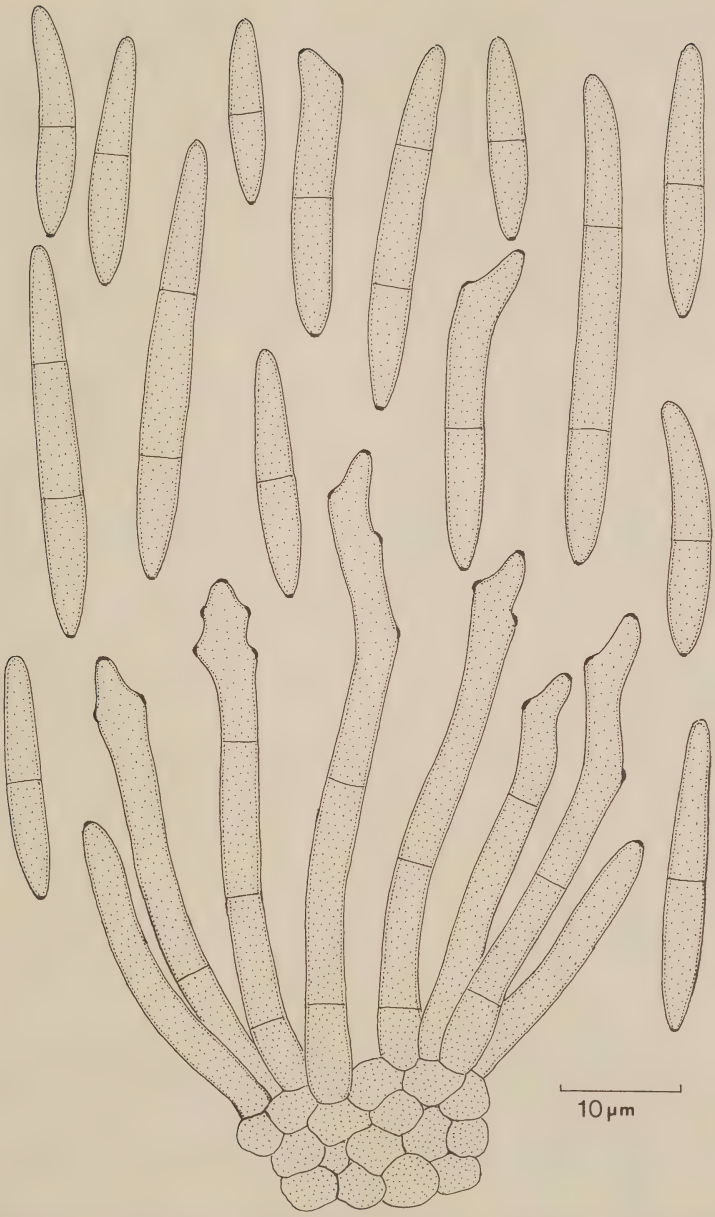

FIGURE 1. *Phaeoramularia clematidis*. Stromata, conidiophores and conidia.

Maculae amphigenae, angulares vel irregulares, atrobrunneae. Caespituli hypophylli, effusi, breviter floccosi, pallide brunnei. Mycelium immersum, ex hyphis hyalinis vel subhyalinis, septatis, ramosis, laevibus, usque ad 3µm crassis compositum. Stromata substomatalia, pseudoparenchymatica, subglobosa, modice densa, compacta, pallide brunnea, 17-28µm lata; ex hyphis pallide brunneis, cellulis inflatis, usque ad 5µm latis compositum. Conidiophora ex cellulis superis stromatum oriunda, semi-macronemata vel macronemata, fasciculata, recta vel flexuosa, pallide brunnea vel pallide olivacea, simplicia, 1 ad 3-septata, laevia, cylindrica, 20-48.5 X 2-4µm. Cellulae conidiogenae in conidiophoris integratae, terminales, polyblasticae, sympodiales, cicatricatae; cicatrices conidiales conspicuae, incrassatae, circa 1um diam. Conidia acropleurogena, solitaria vel interdum catenulata, in catenas simplicia vel ramosas formata, sicca, recta vel leniter curvata, subcylindrica, laevia, subhyalina vel pallidissime brunnea, 1 ad 2-septata, in hila leniter incrassata breviter attenuata, 14-38 X 2.5-5µm.

In foliis vivis *Clematis gourianae*, Naraingarh, Chitwan, Nepal, December 1993, Kamal, HCIO 41486, holotypus, GPU Herb. No. 3493 isotypus.

Leaf lesions amphigenous, usually small, angular or somewhat irregular, dark brown to blackish. Caespituli hypophyllous, shortly floccose, pale brown. Mycelium immersed in the leaf tissue, composed of hyaline to subhyaline, septate, branched, smooth, up to 3µm wide hyphae. Stromata substomatal, well-developed, pseudoparenchymatous, subglobose, compact, pale brown, 17-28µm wide; composed of pale brown hyphae with cells inflated up to 5µm wide. Conidiophores arising from the superficial cells of the stromata, semi-macronematous to macronematous, fasciculate, usually from five to eight per fascicle, straight or flexuous, pale brown to pale olivaceous brown, simple, 1 to 3-septate, smooth, sometimes slightly geniculate, cylindrical, 20-48.5 X 2-4µm. Conidiogenous cells integrated, terminal, polyblastic, sympodial, cicatrized, bearing thickened, conspicuous, about 1µm in diameter, scars; usually up to four. Conidia acropleurogenous, mostly solitary or occasionally catenulate, dry, straight or slightly and gently curved, subcylindrical, smooth, subhyaline to very pale brown, 1 or 2-septate, attenuating toward each end, bearing one or more moderately thickened hila, 14-38 X 2.5-5µm; conidial chains, when present, short, simple or, more rarely, branched.

On living leaves of *Clematis gouriana* L. [Ranunculaceae]; Nepal.

Collection examined: on *C. gouriana*, Naraingarh, Chitwan, Nepal, December 1993, Kamal, HCIO 41486, holotype; GPU Herb. No. 3493, AUA, isotypes.

Two other species of *Phaeoramularia*, known only from their type collections, namely *P. lomaensis* Deighton and *P. sudanensis* Deighton, occur on species of *Clematis* L. The former was described on living leaves of *Clematis grandiflora* DC in Sierra Leone while the latter was encountered on leaves of an unnamed *Clematis* species, probably *C. longicaudae* Steud. ex A. Rich., in the Sudan (Deighton, 1979). Both of these species are evidently quite different from *P. clematidis* having much longer, distinctly branched conidiophores. *Phaeoramularia sudanensis* lacks stromata whereas *P. lomaensis* has very well-developed stromata, up to 50µm wide (Deighton, 1979). Neither causes

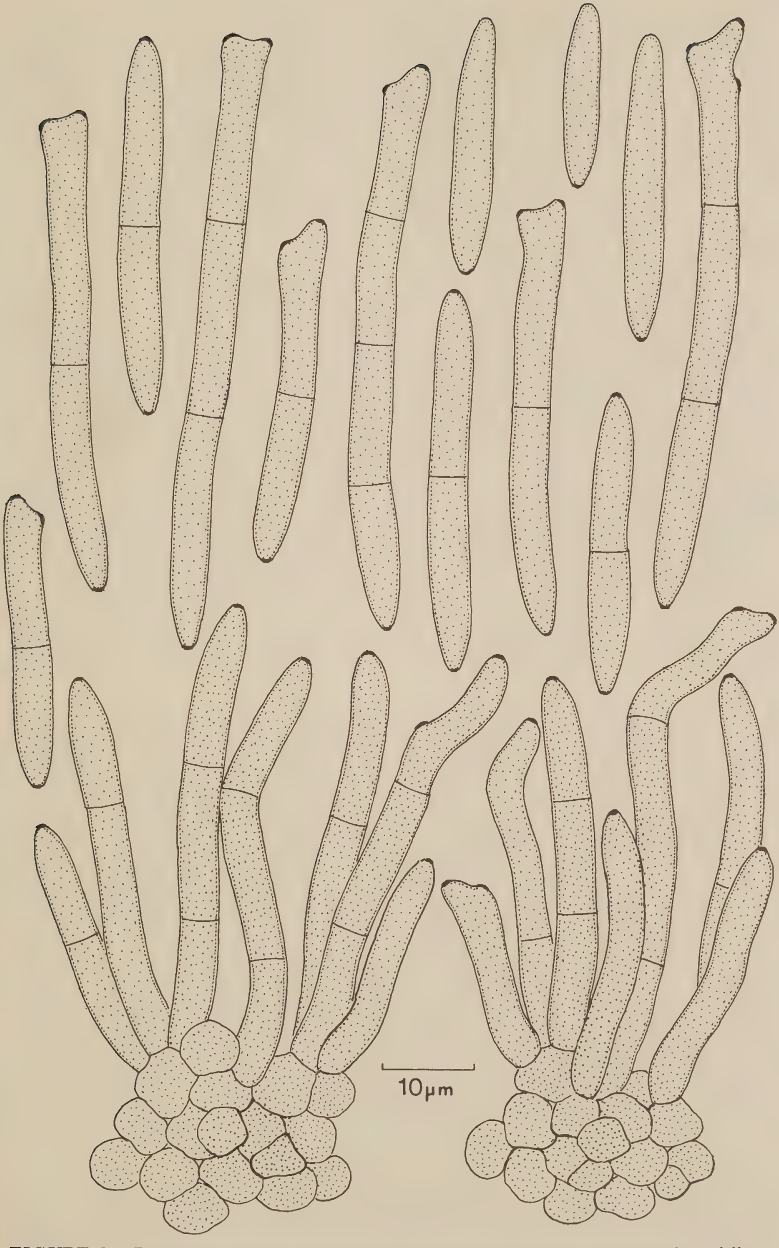

FIGURE 2. *Phaeoramularia nepalensis*. Stromata, conidiophores and conidia.

leaf spot symptoms. The conidial morphology and dimensions of both also differ appreciably from those of *P. clematidis*, the conidia of each being much longer. The conidia of *P. clematidis* bear resemblance to those of such a species as *C. marmorata* (Tranz.) Deighton. There are a number of species of *Phaeoramularia*, such as *P. occidentalis* (Cooke) Deighton, that often bear predominantly solitary conidia. *Phaeoramularia clematidis* possesses this characteristic.

Phaeoramularia nepalensis S.K. Singh et R.K. Chaudhary sp. nov. (Figure 2).

Maculae amphigenae, suborbiculares vel irregulares, saepe vinis limitatae, brunneae. Caespituli hypophylli, pallide brunnei. Mycelium immersum, ex hyphis hyalinis vel subhyalinis, septatis, ramosis, laevibus, usque ad 3µm crassis compositum. Stromata substomatalia, pseudoparenchymatica, subglobosa vel elongata, subhyalina, 37 X 52µm diam. Conidiophora ex cellulis superis stromatum oriunda, semi-macronemata vel macronemata, fasciculata, recta vel flexuosa, subhyalina, simplicia, 0 ad 2-septata, laevia, cylindrica, raro geniculata, 14-48 X 3-5µm. Cellulae conidiogenae in conidiophores integratae, terminales, monoblasticae vel polyblasticae, sympodiales, cicatricatae; cicatrices conidiales conspicuae, incrassatae, circa 1um diam. Conidia acropleurogena, catenata, in catenas simplicia vel ramosas formata, sicca, recta vel leniter curvata, subcylindrica, laevia, subhyalina vel pallidissime brunnea, 0 ad 3-septata, in hila leniter incrassata breviter attenuata, 18-64.5 X 2-5µm.

In foliis vivis *Eupatorium adenophorum*, Kirtipur, Kathmandu Valley, Nepal, November 1993, Kamal, HCIO 41487, holotypus, GPU Herb. No. 3134 isotypus.

Leaf lesions amphigenous, suborbicular to irregular, sometimes coalescing and becoming quite large, limited by veins, mid brown, often with a darker, narrow margin. Caespituli hypophyllous, pale brown. Mycelium immersed in the leaf tissue, composed of hyaline, septate, branched, smooth, up to 3µm wide hyphae. Stromata substomatal, well-developed, pseudoparenchymatous, subglobose to somewhat elongate, subhyaline to very pale brown, 37 X 52µm in diameter. Conidiophores arising from the superficial cells of the stromata, semi-macronematous to macronematous, fasciculate, usually from five to ten per fascicle, straight or some what flexuous, subhyaline, simple, 0 to 2-septate, smooth, cylindrical, rarely slightly geniculate, 14-48 X 3-5µm. Conidiogenous cells integrated, terminal, monoblastic or polyblastic, sympodial, cicatrized, bearing one or two thickened, conspicuous, about 1um in diameter scars. Conidia acropleurogenous, catenate, dry, straight or slightly curved, subcylindrical, smooth, very pale brown, up to 3-septate, mostly 1-septate, attenuating slightly toward the base which bears a thickened hilum, attenuating or very slightly inflated toward the apex which bears one to three thickened scars, 18-64.5 X 2-5µm; conidial chains simple or branched.

On living leaves of *Eupatorium adenophorum* L. [Asteraceae]; Nepal.

Collection examined: on *E. adenophorum*, Kirtipur, Kathmandu Valley, Nepal, November 1993, Kamal, HCIO 41487, holotype; GPU Herb. No. 3134, AUA, isotypes.

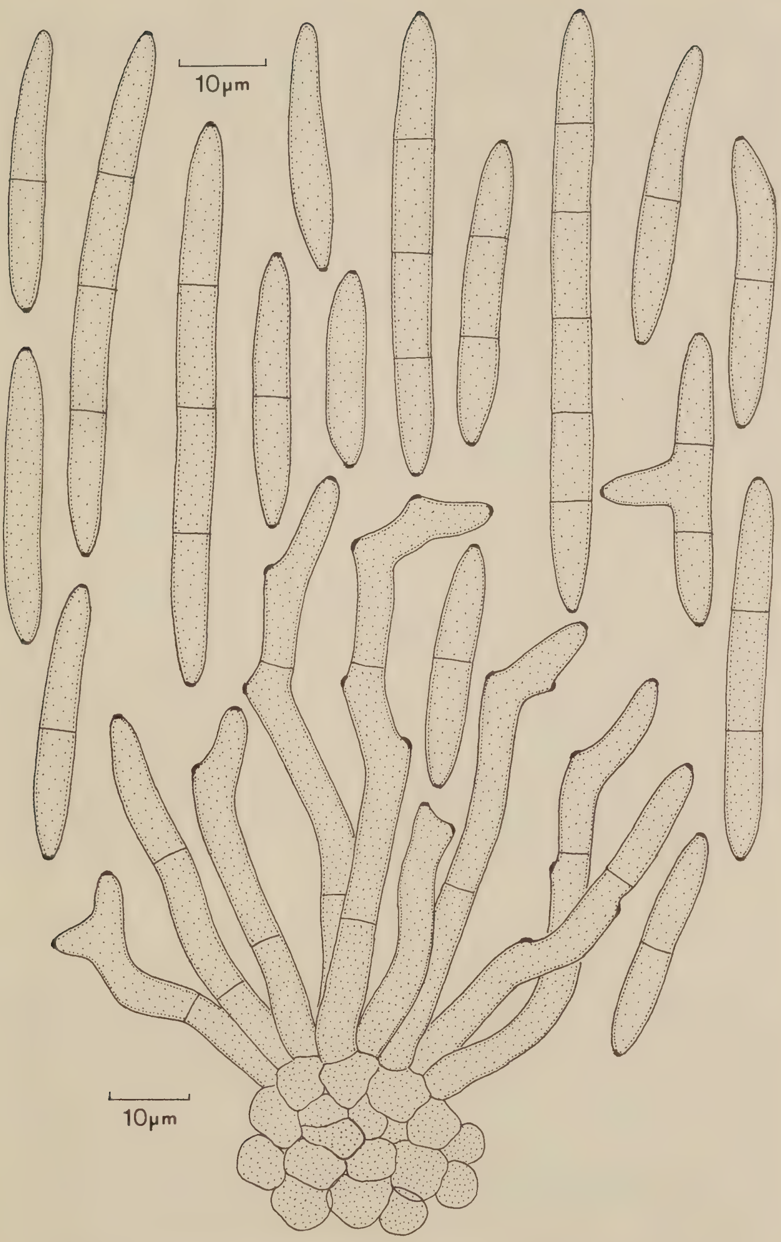

FIGURE 3. *Phaeoramularia pyricola*. Stromata, conidiophores and conidia.

Another species of *Phaeoramularia*, *P. eupatorii-odorati* (Yen) Liu & Guo [≡ *Cercospora eupatorii-odorati* Yen], is known to occur on this host genus. It was described by Yen (1968) from a collection on *Eupatorium odoratum* L. made in Malaysia. It has subsequently been reported on the same host from China (Liu and Guo, 1982). There are also records of the occurrence of *P. eupatorii-odorati* on *Eupatorium adenophorum* and *Ageratina adenophora* (Speng.) R.M. King & H. Robinson, another member of the Asteraceae, in New Zealand (McKenzie, 1990). An unnamed species of *Phaeoramularia*, causing a leaf spot of crofton weed [*A. adenophora*], is being used as a biocontrol agent of that plant in South Africa (Morris, 1989). The fungus is probably *P. eupatorii-odorati*. The genus *Ageratina* Spach is closely related to *Eupatorium* L. and has, in the past, been considered a synonym of it.

Although the conidia of *Phaeoramularia nepalensis* have similar dimensions to those of *P. eupatorii-odorati*, certain other details indicate that they are distinct and different entities. The conidiophores of the former are much shorter than those of the latter and are unbranched. *Phaeoramularia eupatorii-odorati* produces external hyphae bearing the occasional conidiophore, a feature absent in *P. nepalensis*, and its conidia are commonly three-septate or four-septate. Conidia of *P. nepalensis* are predominantly one-septate.

Phaeoramularia pyricola S.K. Singh et R.K. Chaudhary sp. nov. (Figure 3).

Maculae amphigenae, numerosae, irregulares vel rectangulares, saepe venis limitatae, brunneae vel griseae. Caespituli hypophylli, pallide brunnei. Mycelium immersum, ex hyphis hyalinis vel subhyalinis, septatis, ramosis, laevibus, usque ad 3µm crassis compositum. Stromata substomatalia, pseudoparenchymatica, subglobosa, pallide olivacea, 31-34µm diam. Conidiophora ex cellulis superis stromatum oriunda, macronemata, fasciculata, recta vel flexuosa, pallide brunnea vel olivacea, simplicia, 1 ad 3-septata, laevia, geniculata, 24.5-46.5 X 3-6µm. Cellulae conidiogenae in conidiophoris intergratae, terminales vel intercalares, polyblasticae, sympodiales, cicatricatae; cicatrices conidiales conspicuae, incrassatae, circa 1um diam. Conidia acropleurogena, solitaria vel catenata, sicca, recta vel leniter curvata, cylindrica vel subcylindrica, laevia, subhyalina, 0-5-septata, in hila leniter incrassata breviter attenuata, 15-64 X 2.5-5.5µm.

In foliis vivis *Pyri communi*, Kirtipur, Kathmandu Valley, Nepal, November 1993, Kamal, HCIO 41489, holotypus; GPU Herb. No. 3330, isotypus.

Leaf lesions amphigenous, numerous, appearing as irregularly-shaped blotches which often become confluent to cover large areas of the leaf, blackish when viewed from the adaxial surface, brownish or grayish brown on the under surface, often become confluent to cover large areas of the leaf, blackish when viewed from the adaxial surface, brownish or grayish brown on the under surface, often limited by veins to give an angular aspect. Caespituli hypophyllous, pale brown. Mycelium immersed in the leaf tissue, composed of hyaline, septate, branched, smooth, up to 3µm wide hyphae. Stromata substomatal, pseudoparenchymatous, subglobose, pale olivaceous, 31-34µm in diameter. Conidiophores arising form the superficial cells of the stromata, macronematous, fasciculate, straight or, more frequently, flexuose, pale brown to pale olivaceous, simple, 1 to 3-septate, smooth, often somewhat bent toward the apex and geniculate, 24.5-46.5 X 3-6µm. Conidiogenous cells integrated, terminal or becoming intercalary as a result of sympodial growth and septation, polyblastic, cicatrized, usually bearing up to five thickened, conspicuous, about 1um in diameter scars. Conidia acropleurogenous, solitary or, more frequently, catenate, dry, straight or slightly curved, cylindrical or subcylindrical, smooth, subhyaline, 0 to 5-septate, attenuating toward each end, bearing one or more moderately thickened hila, 15-64 X 2.5-5.5µm; conidial chains mostly simple.

On living leaves of *Pyrus communis* L. [Rosaceae]; Nepal.

Collection examined: on *P. communis*, Horticulture Garden, Kirtipur, Kathmandu Valley, Nepal, November 1993, Kamal, HCIO 41489, holotype; GPU Herb. No. 3330, AUA, isotypes.

No other species of *Phaeoramularia* has previously been reported as occurring on the host genus *Pyrus* L. However, *Phaeoramularia pruni* Guo & Liu was described from a collection made on an unnamed species of *Prunus* L., another member of the Rosaceae (Guo and Liu, 1987). Although there are similarities between *P. pyricola* and *P. pruni* they differ in several respects, sufficiently to be recognized as separate species. The conidiophores of *P. pruni* are somewhat longer than those of *P. pyricola* and are sometimes branched. The conidia of *P. pyricola*, although overlapping with those of *P. pruni* in size range, are appreciably longer and more septate; 3-septate conidia predominating as compared to unicellular or 1-septate conidia.

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NOTES ON HYPHOMYCETES. LXVIII. CONCERNING MYCOCENTROSPORA VERATRI, THE CAUSAL ORGANISM OF NECROTIC LEAF-SPOT OF VERATRUM SPECIES (LILIACEAE)

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ABSTRACT

Mycocentrospora veratri (Peck) U. Braun is redescribed and illustrated from its type material.

INTRODUCTION

During the course of studying and describing two novel species of *Mycocentrospora* Deighton collected in India (Srivastava *et al.*, 1995) occasion arose to review the status of a number of taxa currently classified within it, from both a taxonomic and nomenclatural perspective. In the process it became apparent that the genus remains somewhat heterogeneous and a reevaluation of several of its taxa is desirable. Braun (1993) reached the same conclusion and excluded all but three species from the genus. Several taxa classified in the genus by Deighton (1972, 1983) were transferred into *Pseudocercospora* Speg., while the reclassification of others was left in abeyance. As a contribution to our knowledge of fungi accommodated in *Mycocentrospora* several species have been investigated and will be reported upon in this series of papers. One is treated herein.

The fungus presently classified as *Mycocentrospora veratri* was originally described under the name *Cercosporella veratri* Peck (Peck, 1891), based on a collection made on *Veratrum viride* Aiton in the state of New York. The published type description of it reads as follows; "Spots suborbicular or elliptical, blackish, slightly frosted by the epiphyllous subfusiform, mostly triseptate colorless spores, which terminate at one end in a long slender tapering almost hair-like point; hyphae very short, almost obsolete; spores .002 to .004 in. long, .00016 to .0002 broad in the widest part. Languishing leaves of Indian poke, *Veratrum viride*. Morehouseville. July.". Leaf spots and conidia were figured but not conidiophores. Interestingly, in the same publication, conidiophores, referred to as hyphae bearing spores, of two species of *Ramularia*, *R. graminicola* Peck and *R. destruens* Peck, were illustrated, perhaps indicating that Peck had some difficulty observing those of *C. veratri*.

This is mentioned because a similar experience seems to have also befallen several subsequent authors.

A year later, Allescher (1892) independently established the binomial *Fusoma veratri* Allesch. for a fungus occurring on wilted leaves of *Veratrum lobelianum* Bernh. [*Veratrum album* L.], collected at Oberammergau, Bavaria. A translation of the German description of it reads as follows; "Sorus on leaf surface spreading, whitish, almost round or longish, indeterminate, 2-3mm diam; Conidia like a bundle combined, sickle-shaped bent, almost fusiform, distichous, the upper cell narrowing upwards, acute rostrate, the lower cell gradually thickened downwards, at the end a little narrower, with a septum, either not or slightly constricted, hyaline, 30-40 X 3-5". A footnote was added stating that the fungus formed white, small, 1-3mm in size, mostly round, crumbly, effuse colonies on the leaf surface and might be closely related to *Fusoma farina* (Schw.) Sacc. [≡ *Fusidium farina* Schw. (Schweinitz, 1834)]. The genus *Fusoma* Corda (Corda, 1837), with two original species, *F. helmisporii* Corda and *F. ochraceum* Corda is now considered as a *nomen dubium* (Carmichael *et al.*, 1980). Hughes (1958), in the absence of type or authenticated material, could not establish the identity of either of these taxa. A third species added to the genus by Corda (1838), *Fusoma tetracoilum* Corda, is now classified as *Septonema tetracoilum* (Corda) Hughes. In any case, *F. veratri* has been considered a facultative synonym of *M. veratri* by some authors (Ondřej, 1974; Braun, 1991).

Ellis and Everhart (1894) described a fungus causing spots on leaves of *Veratrum californicum* E.M. Durant in Pullman, Washington, under the name *Marsonia veratri* Ell. & Everh. It was given the following description; "Spots amphigenous, small (2-3 mm.), whitish, with a broad, dull-purple border, which is often elongated in the direction of the veins of the leaf for 2-3 cm., with the ends acute, finally more or less confluent, the entire leaf becoming brown and dead. Acervuli small, occupying the centre of the spots, or irregularly scattered over them. Conidia clavate-cylindrical, curved, upper end subtruncate, lower end attenuated and subacute, uniseptate, hyaline, 18-22 X 3-3.5µm.".

Schroeter (1897) transferred *Cercosporella veratri* into the genus *Septocylindrium* Bonorden ex Sacc., whose type species is *S. septatum* (Bonorden) Lindau, a fungus with catenate conidia, described as a hyaline counterpart of *Septonema secedens* Corda (Lindau, 1907). A new combination based on *Fusoma veratri* was also made when Wollenweber (1917) established the name *Septogloeum veratri* (Allesch.) Wollenw. A further synonym, *Gloeosporium veratri* (Allesch.) Höhn., also exists [see nomenclator below]. The combination *Fusarium veratri* (Allesch.) Höhn. was mentioned by Wollenweber (loc.cit.) but we are unaware of this ever having been formally published and assume that it was merely a herbarium designation. Moesz (1930) repeated the recombination made earlier by Wollenweber.

Savile (1961) reported a "trace" of *M. veratri* [as *Cercosporella veratri*] occurring with *Puccinia veratra* Duby on *Veratrum eschscholtzii* A. Gray [*Veratrum album*] in British Columbia, Canada. A brief description was provided in which the conidia were reported to measure 57-86(-94) X 2.2-3.2µm with 3-8(-10) septa. Conidiophores were said to be generally less than 20µm long but no further details were given. Examination of an isotype specimen in the herbarium of John Dearness housed at DAOM revealed the conidia of that material to be up to 74µm long and 4µm wide, with 3-4 septa.

In his revision of the genus *Gloeosporium* Desm. & Mont., in which the more than seven hundred binomials existing within it were considered, von Arx (1970) made the comment that *Gloeosporium veratri* needed further investigation. In addition to its obligate synonyms, *Fusoma veratri* [the basionym] and *Septogloeum veratri*, the facultative synonyms *Marsonia veratri* and *Marssonina veratri* were included, with the remark that none of these generic names seemed to be correct for the fungus. Petrak (1937) had earlier listed *Marsonia veratri* as a synonym of *G. veratri*. As recent as a few years ago, however, the name *Gloeosporium veratri* was still accepted and in circulation, with *Marsonia veratri* listed as a synonym (Farr *et al.*, 1989). In the same publication the binomial *Cercosporella veratri* remained in use, despite the prior name change to *Centrospora veratri*, and was treated separately from *Gloeosporium veratri*, presumably on the continuing assumption that the two names are based on different fungi. We thus have a current situation where some authors (Ondřej, 1974; Braun, 1991) treat *Fusoma veratri* as a synonym of *Mycocentrospora veratri*, whereas others (von Arx, 1970; Farr *et al.*, 1989) maintain it separately, in the form of *Gloeosporium veratri*. No mention of the obligate synonyms of *F. veratri* was, incidentally, made by either Ondřej (loc. cit.) or Braun (loc. cit.). Neither, apparently, were these authors aware of the existence of the name *Marsonia veratri* and its obligate synonym *Marssonina veratri* and their possible synonomy with *Fusoma veratri* and, therefore, with *Mycocentrospora veratri*.

Ondřej (1974) described and illustrated *Cercosporella veratri* based on a number of collections made on *Veratrum album* ssp. *lobelianum* (Bernh.) Rchb. in the then Czechoslovakia (including material from Cechy [Bohemia], Moravia, and Slovakia). The new combination *Centrospora veratri* (Peck) Ondřej was proposed. Specimens cited included ones upon which previously reported records of the fungus from the region were based (Baudyš, 1924; Baudyš and Picbauer, 1923; Picbauer, 1941, 1956). Leaf lesions were said to be ellipsoid or round, white, 1-4mm in diameter. On older leaves colonies appeared white, effuse and powdery. Conidiophores were described as hyaline, short, 3-4 X 3µm in size. No sympodial conidiophore proliferation was reported or figured. In the drawing provided conidiophores are shown as short, stubby, more or less isodiametric cells borne laterally on hyphae. Conidia were reported to be two-celled, 15-30(40) X 3-4µm, four- to five-celled, 30-50 X 3-5µm, or seven-celled, 50-100 X 3-5.5µm, sometimes bearing a basal appendage, 3-5 X 1µm. It was noted that, at a young stage, two-celled *Marssonina*-like conidia were produced. Baudyš (1924) had also reported two-celled, as well as three-celled, conidia, the latter being 50µm in length.

Braun (1991) reclassified *Cercosporella veratri* in *Mycocentrospora*, as *M. veratri*, and provided a very brief description of it as follows; "Conidiophores solitary, ca. 5-20 X 3-7µm, hyaline, + geniculate, aseptate, conidial scars flat, broad, unthickened, conidia formed singly, ca. 30-70 X 3-7µm, rostrate, obclavate, hyaline, smooth, multiseptate, base truncate ca. 2-3µm wide.". The conidiophores figured were cylindrical in shape.

In order to resolve the nomenclatural confusion surrounding this fungus the type specimens on which the names [basionyms] *Cercosporella veratri* and *Marsonia veratri* are based have been examined. In addition, the original collection of *Fusidium farina* has been studied. It has not been possible to examine the type material of *Fusoma veratri*.

TAXONOMIC PART

Mycocentrospora veratri (Peck) U. Braun, *Nova Hedwigia* 53:296, 1991 (Figure 1).

≡ *Cercosporella veratri* Peck, *Ann. Rep. N.Y. State Mus.* 44:27, 1891.

≡ *Septocylindrium veratri* (Peck) Schroet., *Schles. Krypt.-Fl., Pilze* II, 494, 1897.

≡ *Centrospora veratri* (Peck) Ondřej, *Česká Mykol.* 28:187, 1974.

= *Fusoma veratri* Allescher, *Ber. Bayer Bot. Ges.* 2:19, 1892.

≡ *Septogloeum veratri* (Allesch.) Wollenweber, *Ann. mycol.* 15:27, 1917.

≡ *Gloeosporium veratri* (Allesch.) Höhn., *Mitt. Bot. Inst. Techn. Hochsch. Wien* 4:112, 1927.

≡ *Septogloeum veratri* (Allesch.) Moesz, *Folia Cryptogamica* 1:814, 1930.

Leaf lesions amphigenous but more prominent on the adaxial surface, scattered or gregarious or occasionally confluent, orbicular to ellipsoid or somewhat irregularly shaped, oriented parallel to the long axis, at first whitish to grayish-green, with a darker, brownish, narrow margin, eventually becoming more or less uniformly dark brown, or zonate, dark brown over the central two-thirds with a bordering paler zone and again dark in a narrow band at the periphery, up to 17mm in length, 9mm wide. Spots appearing much paler and more evenly colored when viewed from the abaxial surface. Colonies epiphyllous, more or less restricted to the central portion of the leaf spot but sometimes effuse to the edges, becoming white and farinaceous with the production of abundant conidia. Mycelium immersed in the host tissue, composed of hyaline, septate, branched, smooth, 2.5 - 4µm wide hyphae. Hyphal cells often swollen, subglobose, up to 7µm wide, forming small, loose, stromata-like clusters. Conidiophores, in the form of single conidiogenous cells, micronematous to semimacronematous, mononematous, originating laterally from variously inflated hyphal cells, polyblastic, sympodial, more or less flask-shaped with a lower, swollen portion and a neck-like extension, hyaline, smooth, bearing fertile loci sometimes at the tip of short, peg-like protrusions, cicatrized, each forming up to four conidia, up to 18µm long, 7µm wide where broadest and 3 - 3.5µm wide toward the apex; conidial scars conspicuous, flat, broad, unthickened. Conidia acropleurogenous, solitary, dry, simple, straight or curved toward the upper third, obclavate, rostrate, one to

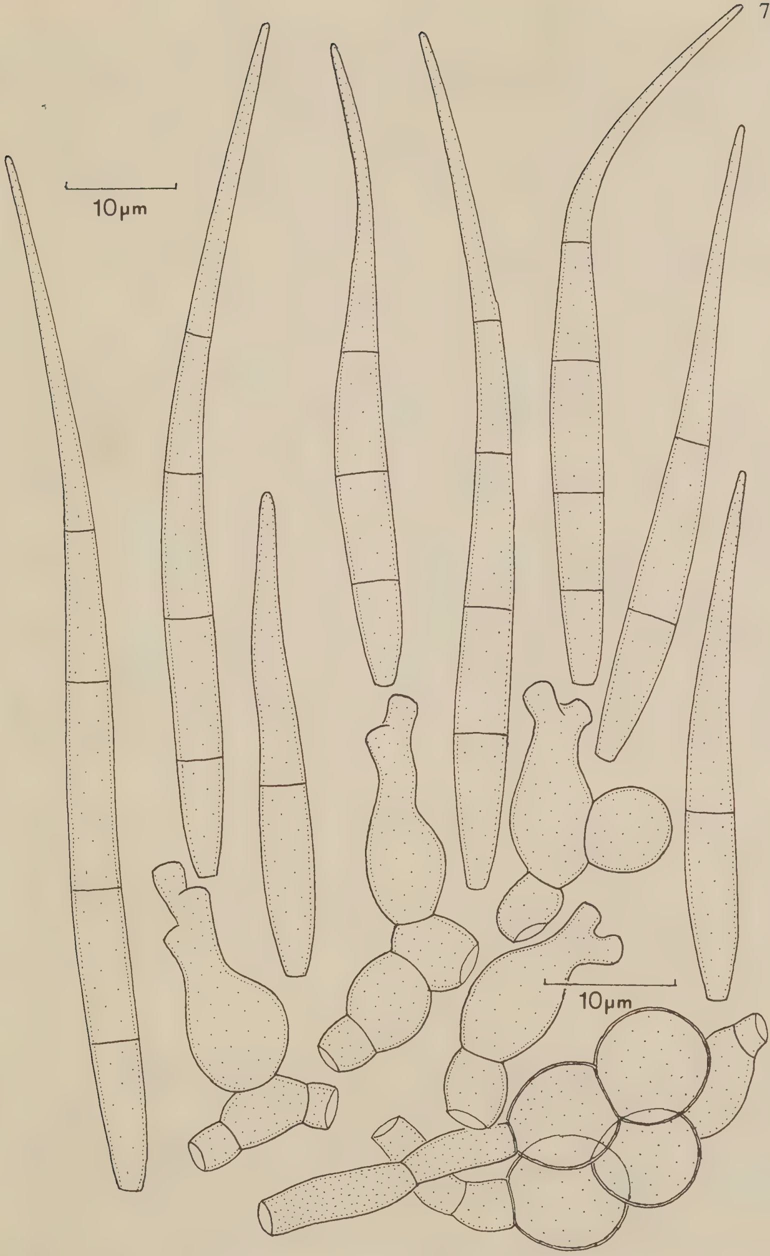

FIGURE 1. *Mycocentrospora veratri*. Conidia, conidiophores and swollen hyphal cells.

four-septate, subhyaline, smooth, truncate at the base, two-celled conidia measuring 33.5 - 43 [40] X 4-5µm, four- celled conidia 48-75[59] X 4-5µm, and five-celled 62.5-84[72] X 4-5µm; attenuating slightly toward the base which bears an unthickened hilum.

On living leaves of species of *Veratrum* L. [Liliaceae]; Europe and North America.

Collection examined: on *V. viride*, Morehouseville, New York, U.S.A., July, C.H. Peck, NYS, holotype.

DISCUSSION

Type material of *Fusoma veratri* Allescher could not be located in the herbarium of the Botanische Staatssammlung München but it is reasonably certain from the original description that this name was based upon a collection of *Mycocentrospora veratri* and is thus listed as a synonym in the above nomenclator. A study of the type specimen of *Marsonia veratri* [*Proc. Acad. Nat. Sci. Philadelphia* 337, 1894 ≡ *Marssonina veratri* (Ell. & Everh.) Magnus, *Hedwigia* 45:91, 1906] reveals that this is an entirely different fungus. Petrak (1937) and von Arx (1970) were therefore incorrect in listing *M. veratri* as a synonym of *Fusoma veratri* [as *Gloeosporium veratri*]. *Marssonina veratri* is not, however, satisfactorily classified in *Marssonina* Magnus and should be transferred to the genus *Colletogloeum* Petrak. This will be treated in a separate publication. The identity of *Fusidium farina* Schw. is difficult to establish from a study of its type specimen [collected at Salem, North Carolina. Schweinitz Herbarium:Syn. fung. Am. bor. no. 2994] which consists of a piece of bark bearing a lichen-like, crustose, whitish, farinaceous growth. No fusiform, septate conidia, mentioned in the original description, were observed. It is highly unlikely that this bears any relationship to the fungus described in this paper.

Mycocentrospora veratri, although having conidiophores that are rather different in morphology from those of *M. acerina* (Hartig) Deighton, the type species of *Mycocentrospora*, seems satisfactorily classified in the genus. Its conidia are similar to those of *M. acerina* and it produces swollen hyphal cells but these are not pigmented as in that species. The discrepancies in the accounts and illustrations of the conidiogenous cells of *M. veratri* in the literature have possibly occurred because of their small size and the fact that they are difficult to observe.

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NEW DICTYOSPOROUS SPECIES FROM LEAVES OF AGAVACEAE

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Summary: A new genus, *Pleoseptum*, is established and the type species, *P. yuccaesedum* described and illustrated. Other new species described in existing genera are *Splanchnonema nolinae, Camarosporium nolinae, Chaetoplea rosipapilla, Montagnula dasylirionis, M. mohavensis, M. yuccigena, Pleospora nolinae, Camarosporium agavensis* and *C. agavifoliorum.*

Introduction: Fungal species with pigmented dictyospores that have been reported from the Agavaceae (2, 4, 5, 10, 12) include *Camarosporium yuccaesedum* Fairm., *Montagnula infernalis* (Niessl) Berl., *M. phragmospora* (Durieu & Mont.) Crivelli, *M. thumeniana* (Sacc.) Crivelli, *M. bataanensis* (Petr.) Crivelli, *Pleospora agavicola* Sivan., *P. ellisii* Wehm., and *Teichospora aridophila* Peck. Synonymy for the Loculoascomycete species may be found in Barr (2), Sivanesan (10), and Wehmeyer (12). Recent collections of members of the Agavaceae in the southwestern United States contain several fungi with pigmented dictyospores that belong to none of these taxa, necessitating establishment of a new genus and several new species.

Materials and Methods: Teleomorphs were connected to their anamorphs by comparison of cultures and the conidia produced in the cultures from suspected phases of a holomorph. Conidia were spread on potato dextrose agar (PDA) and single spore isolates were subcultured on PDA. Single asci were washed three times in sterile tap water and placed on PDA. Axenic subcultures were grown on PDA. All cultures were grown at room temperature.

Taxonomy: The new genus *Pleoseptum* is proposed to accommodate a commonly collected foliar fungus on *Yucca baccata*.

Pleoseptum yuccaesedum A. W. Ramaley *et* M. E. Barr, *gen. et sp. nov.*, Fig. 1, A, B.

Ascomata immersa, subepidermalia, vertices contra epidermidem hospitis depressi, 250-500 µm diam, cavitates globosae vel sphaeroideae, papilla parva apicalis epidermis hospitis penetrans, aliquot hyphae ex parietibus in substratum; peridium 40-60 µm latum basi et lateribus vel 75 µm latum versus apicem, ex 5-8 stratis cellularum atropurpureobrunnearum pseudoparenchymatarum compositum. Asci bitunicati, 115-225 x 16-24 µm, octospori. Pseudoparaphyses cellulosae. Ascosporae 22.4-35.2 x 12-15.2 µm, luteae vel fulvae atrobrunnescentes, subellipsoideae et symmetricae vel obovoideae, interdum fusoideae, equilaterales, extrema obtuse rotundata vel apicaliter apiculata, raro basaliter apiculata, lineolatae, septis constrictae, 3-7-septatae.

HOLOTYPUS: U. S. A. COLORADO: Montezuma County, hillside near Mesa Verde National Park entrance, *in foliis mortuis Yuccae baccata* Torr., 11 October 1992, Annette Ramaley 9237A, BPI 802381. ISOTYPE: UC 1475127. Paratype: U. S. A. NEW MEXICO: San Juan County, 1.3 miles from U. S. Hwy. 550 on County Road 2300, then right to Rhodes Arch, dead leaves of *Yucca baccata*, 10 October 1992, Annette Ramaley 9236A, BPI 802379, NY.

Ascomata immersed, subepidermal, the top flattened against the host epidermis, 250-500 µm diam, cavities globose or spheroid, apex with a small papilla penetrating the host epidermis, a few hyphae from the peridium into the substrate; peridium 40-60 µm wide at the bottom and sides to 75 µm apically, composed of 5-8 layers of dark, purplish brown, thick-walled pseudoparenchymatous cells. Asci 115-225 x 16-24 µm, 8-spored (Fig. 1, A). Pseudoparaphyses cellular. Ascospores 22.4-35.2 x 12-15.2 µm (Fig. 1, B), yellow or yellowish brown becoming dark brown, nearly ellipsoid and symmetric to obovoid, sometimes fusoid, equilateral, both ends bluntly rounded or with an apiculus at the apex, rarely at the base, lineolate, constricted at the septa, 3-7-septate.

Anamorph: *Camarosporium yuccaesedum* Fairm., Fig. 1, C-F.

Conidiomata pycnidial (Fig. 1, D), immersed, subepidermal, separate, unilocular, globose to spheroid to conoid, the top flat against the host epidermis, usually for the entire width of the conidioma, very dark brown; the wall composed of 4-6 layers of purplish brown pseudoparenchymatous cells at the bottom and sides, becoming paler in the interior, and 1-3 layers of hyaline cells in the interior, 250-450 µm diam, sometimes with some hyphae from the wall into the substrate. Ostiole single, circular, central, a small papilla penetrating the host epidermis. Conidiogenous cells (Fig. 1, C) indeterminate or determinate, discrete, smooth, hyaline, formed from the inner cells of the conidiomatal wall. Macroconidia 20.8-34.4 (-38.4) x (9.6-) 11.2-15.2 µm (Fig. 1, E), mostly ellipsoid or clavate but the shape variable, especially in older conidiomata, base truncate, apex obtuse, yellowish brown, muriform, lineolate, constricted at the septa, 3-7-septate. Conidial ontogeny holoblastic by apical wall building; conidiogenous cell proliferation enteroblastic; additional conidia secede at the same level or at successively higher levels with up to five annellations. Microconidiogenous cells located on the upper wall near the ostiole and in the ostiolar channel, discrete, smooth, hyaline. Microconidia mostly 4-10 x 4-7 μm, ovoid, globose, or with a truncate base and obtuse apex, smooth, hyaline, aseptate.

Material examined: U. S. A. COLORADO: Montezuma County, hillside near entrance to Mesa Verde National Park, dead leaves of *Yucca baccata* Torr., 11 October 1992, Annette Ramaley 9237B, BPI 802378, COLO 489410; NEW MEXICO: San Juan County, 1.3 miles from U. S. Hwy. 550 on County Road 2300, then right to Rhodes Arch, 10 October 1992, Annette Ramaley 9236B, NY, UC 1475126; NEW MEXICO: Colfax County, vicinity of Ute Park, 2200-2900 m, 22 August 1916, Paul C. Standley 13417, BPI 375636, HOLOTYPUS.

Ascomata of *Pleoseptum* approach several species of *Chaetoplea* in shape, but have thick-walled, dark cells in the peridium, more like those in *Leptosphaeria.* Like *L. maculans* (Desm.) Ces. & De Not. and *L. millefolii* (Fuckel) Niessl (7), *P. yuccigena* has a *Camarosporium* anamorph, but the dictyosporous ascospores separate it from the phragmosporous species of *Leptosphaeria*. *Pleoseptum* cannot be assigned to *Heptameria*, whose fusoid ascospores are transversely septate at both ends and dictyosporous only in the mid-region, and whose anamorph is a coelomycete with hyaline, aseptate conidia. *Pleoseptum* can also be distinguished from *Curreya*, whose ascomata have a rounded apex and are occasionally connected in a small stroma. The anamorph for *Curreya*, by association, is a *Coniothyrium*-like coelomycete. The wall ornamentation of *Pleoseptum* ascospores, foveolae in linear rows, is similar to that in the flattened ascospores of *Platysporoides vulgaris* (Wehm.) Shoemaker & C. E. Babc. (9) and in the terete ascospores of *Pleospora discors* (Durieu & Mont.) Ces. & DeNot. (8); ascoma shape, peridium structure, and the anamorph all separate *P. yuccaesedum* from these species.

Ascomata of *Pleoseptum yuccaesedum* and conidiomata of *Camarosporium yuccaesedum* (Fig. 1, D) are structurally similar, and only reliably identified by their contents. Both structures characteristically have a rounded bottom with the wall extending upward from the equator and flattened against the host epidermis. Cells in the wall are also similar in size and color. Ascomata and conidiomata may be in separate spots or even adjacent in the same spot. The lineolate ornamentation (Fig. 1, F) of ascospores is indistinguishable from that of conidia.

A species of *Splanchnonema* from leaves of *Nolina*, a substrate unique for the Pleomassariaceae, must be added to those described by Barr (1, 2, 3) from woody substrates. *S. nolinae* has soft-walled, oblong ascomata, taller than broad, situated between the thick bands of longitudinal fibers in leaves of *Nolina*. The ascospores are mostly 7-septate.

Splanchnonema nolinae A. W. Ramaley *et* M. E. Barr, *sp. nov.* Fig. 2, A, B.

Ascomata immersa, subepidermalia, oblonga, 300-400 µm lata, usque ad 500 µm longa, et 400-500 µm elata; papilla ca 200 µm lata; peridium 25-40 µm latum basi et lateribus, ex cellulis rufobrunneis pseudoparenchymatis compositum, hyphae subhyalinae ex parietibus in substratum. Asci bitunicati, 140-190 x 22.4-30.4 µm tetra- vel octospori. Pseudoparaphyses cellulosae. Ascosporae 28.8-45.6 x 12-16.8 µm, luteae vel atrobrunneae, subellipsoideae et symmetricae vel obovoideae, equilaterales vel subcurvatae, extrema obtusa, longitrorsum biseptatae, A1 septum medium, euseptatum, septa addita distoseptata, A1 septo et interdum septis alteris constrictae, 5-9- sed plerumque 7-septatae, subtiliter foveolatae vel leves, tunica gelatinosa circumcinctae.

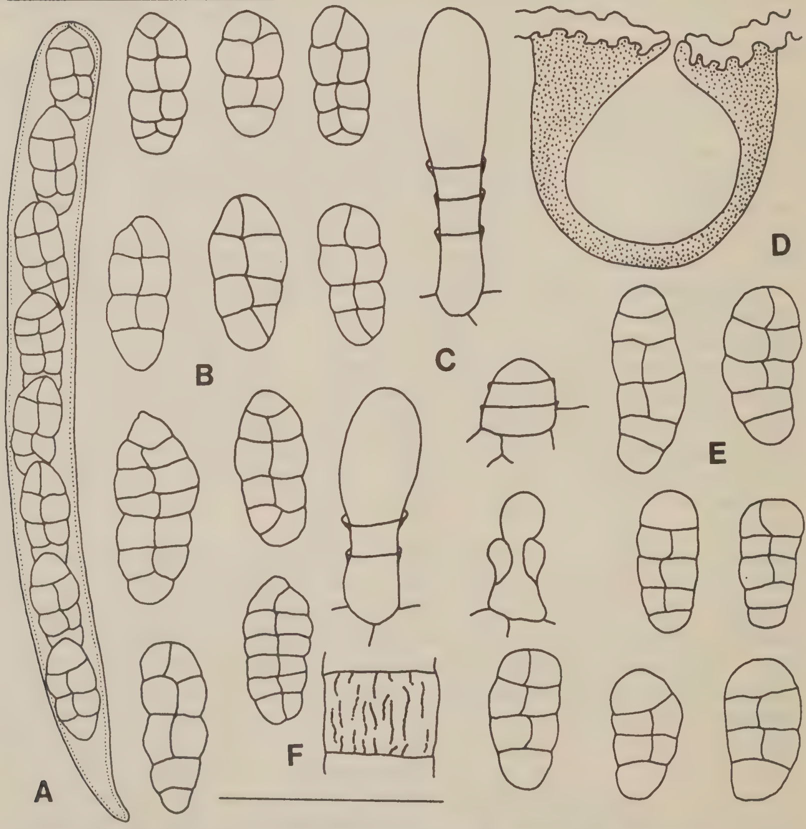

Figure 1. A, B. *Pleoseptum yuccaesedum*: A, ascus; B, ascospores. C-E. *Camarosporium yuccaesedum*: C, conidiogenous cells; D, conidioma in vertical section; E, conidia; F, lineolate ornamentation of conidium and ascospore walls. Standard line: A=60 µm; B, E=40 µm; C=30 µm; D=240 µm; F=12 µm.

HOLOTYPUS: U. S. A. TEXAS: Brewster County, roadside 2.9 miles from U. S. Hwy. 385 on road to Chisos Mountain Basin, *in foliis mortuis Nolinae sp.*, 22 May 1993, Annette Ramaley 9312A, BPI 802374.

Ascomata immersed, subepidermal, oblong, 300-400 μm wide, up to 500 μm long, and 400-500 μm tall; papilla ca 200 μm wide, peridium 25-40 μm wide at the bottom and sides, composed of reddish brown to dark brown pseudoparenchymatous cells, nearly hyaline hyphae from the walls into the substrate. Asci 140-190 x 22.4-30.4 μm (Fig. 2, A), 4-8-spored. Pseudoparaphyses cellular. Ascospores 28.8-45.6 x 12-16.8 μm (Fig. 2, B), yellow to dark brown, nearly ellipsoid and symmetric to obovoid, equilateral to slightly curved, ends obtuse, with 2 longitudinal septa, A1 septum median, euseptate, additional septa distoseptate, constricted at A1 and sometimes other septa, 5-9- but mostly 7-septate, finely foveolate or smooth, surrounded by gel coating.

Anamorph: ***Camarosporium nolinae*** A. W. Ramaley *et* M. E. Barr, *sp. nov.*, Fig. 2, C-E.

Conidiomata pycnidia, amphigena, immersa, subepidermalia, oblonga, unilocularia; paries mollis, 15-25 μm crassus, ex 4-8 stratis cellularum atrorufobrunnearum pseudoparenchymaticarum et 1-2 stratis cellularum hyalinarum interiorum compositus, 250-300 μm lata, 250-500 μm longa, 250-350 μm elata; aliquot hyphae ex parietibus in substratum. Ostiolum singulare, centrale, oblongatum, papilla ca 30 μm elata. Cellulae conidiogenae determinatae vel indeterminatae, discretae, leves, hyalinae, cylindricae, ex cellulis interioribus parietis conidiomatis formatae. Macroconidia 17.6-28 x 8.8-10.4 (-12.8) um, ellipsoidea vel clavata vel prope cylindrica, apex obtusus, basis obtuse rotundata vel truncata, aliquantum constricta septis, rufobrunnea, muriformia vel tantum transverse septata, subtiliter foveolata, 3-5 (-6)-septata. Ontogenesis conidiis holoblastica constructione ad parietes apicalem; proliferatio cellularum conidiogenarum enteroblastica; conidia addita ad idem punctum vel puncta successiva altiora producentia, usque ad quinqueannellatae. Microconidia 4.8-8 x 3.2-5.6 μm, prope ostiolo et in canale ostioli formata, ovoidea vel globosa vel basis truncata et apex obtusus, levia, hyalina, aseptata.

HOLOTYPUS: U. S. A. TEXAS: Brewster County, roadside 2.9 miles from U. S. Hwy. 385, on road to Chisos Mountain Basin, *in foliis mortuis et maculis mortuis foliorum vivorum Nolinae sp.*, 22 May 1993, Annette Ramaley 9312B, BPI 802377.

Conidiomata pycnidial (Fig. 2, C), amphigenous, immersed, subepidermal, oblong, unilocular; wall soft, 15-25 μm thick, composed of 4-8 layers of dark red-brown pseudoparenchymatous cells and 1-2 layers of hyaline cells in the interior, 250-300 μm wide, 250-500 μm long, 250-350 μm tall; some hyphae from the wall into the substrate. Ostiole single, central, oblong, the papilla ca 30 μm tall. Conidiogenous cells determinate or indeterminate (Fig. 2, E), discrete, smooth, hyaline, cylindric, formed from the inner cells of the conidiomatal wall. Macroconidia 17.6-28 x 8.8-10.4 (-12.8) μm (Fig. 2, D),

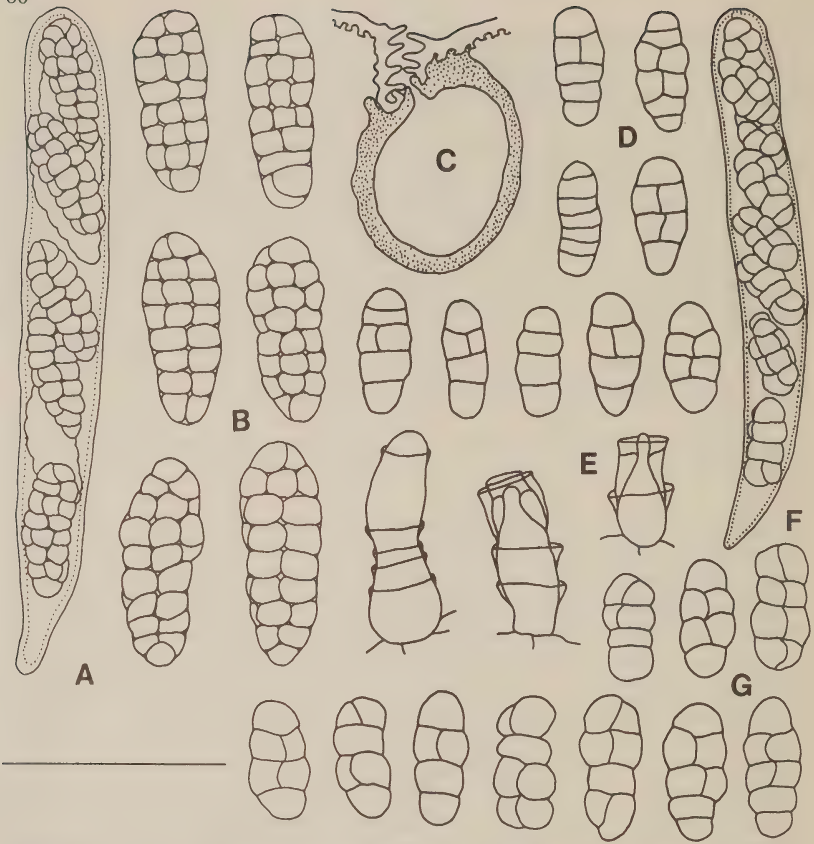

Figure 2. A, B. *Splanchnonema nolinae*: A, ascus; B, ascospores. C-E. *Camarosporium nolinae*: C, conidioma in vertical section; D, conidia; E, conidiogenous cells. F, G. *Chaetoplea rosipapilla*: F, ascus; G, ascospores. Standard line: A, F=60 μm; B, D, G=40μm; C=240μm; E=30 μm.

ellipsoid or clavate to nearly cylindric, apex obtuse, base bluntly rounded or truncate, somewhat constricted at the septa, reddish brown, muriform or only transversely septate, finely foveolate, 3-5 (-6)-septate. Conidial ontogeny holoblastic by apical wall building; conidiogenous cell proliferation enteroblastic; additional conidia produced at the same or at successively higher levels, up to five annellate. Microconidia 4.8-8 x 3.2-5.6 μm, formed near the ostiole and in the ostiolar channel, ovoid or globose or with a truncate base and obtuse apex, smooth, hyaline, aseptate.

Montagnula in North America is represented by species (2) confined to leaf tissues of large monocots. These species have ascospores with a maximum length of 30 μm (2). *Montagnula phragmospora* was recently collected on dead leaves of *Agave neomexicana* Wooten & Standley (U. S. A. TEXAS: Brewster County, off U. S. Hwy. 385, along road to Chisos Mountain Basin, 22 May 1993, Annette Ramaley 9313, BPI 802373. This is the first recorded collection of *M. phragmospora* on *Agave* in the United States; it has been reported from species of *Yucca*. The ascospores measured 27.2-32 x 12-16 μm, somewhat larger than previously reported for this species (21-30 x 10-14), but showing the same insertion of A2 septa close to the A1 septum. Three new species of *Montagnula* must be described, two of them with ascospores consistently longer than 35 μm. *Montagnula dasylirionis* has dark clypeal tissue over a single oblong ascoma or joined over adjacent ascomata. The large, obovoid to fusoid ascospores may have an apical apiculus. *M. mohavensis* also has large ascospores, but the apiculus, when present, is at the base. The loose, dark clypeus supertends a single globose to spheroid ascoma which may be much larger than the ascomata of *M. dasylirionis*. Only the largest ascospores of *M. yuccigena* overlap the length of the smallest ascospores of *M. mohavensis*, but ascospore shape is the same in these two species. The clypeus for *M. yuccigena* may be nonexistent. The apex of the dark ascomatal wall is associated with the host epidermis, and dark hyphae radiate from its surface as they do over the rest of the peridium. Alternatively, a clypeus may be present as a loose, dark weft of hyphae between the upper part of the ascoma and the host epidermis.

Montagnula dasylirionis A. W. Ramaley *et* M. E. Barr, *sp. nov.*, Fig. 3, A-C.

Ascomata immersa, subepidermalia, oblonga, 275-350 μm lata, 350-600 μm longa, et 250-420 μm elata, papilla apicalis brevis et crassa, clypeus atratus, super unum ascoma vel aliquot ascomata; peridium 25-35 μm crassum, molle, ex 5-9 stratis cellularum parvarum atrorufobrunnearum pseudoparenchymatarum et aliquot stratis cellularum hyalinarum depressarum internarum compositum, hyphae subbrunneae vel brunneae ex parietibus in substratum. Asci bitunicati, 185-235 x 24-32 μm, 2-8-spori, clavati. Pseudoparaphyses cellulosae. Ascosporae 35.2-50.4 (-56) x 16-20 (-23.2) μm, juniores aureae, vetustiores aureobrunneae vel atrobrunneae, aliquantum asymmetricae, hemispora supera leviter latior quam hemispora infera, interdum leviter inequilaterales, obovoideae fusoideae, versus extrema rotundata attenuatae, basis magis obtuse rotundata quam apex, interdum apex apiculatus, subtiliter foveolatae, A1 et A2 septis et saepe septis alteris constrictae, 7(-10)-septatae, longitudinaliter 1-2-septatae, tunica gelatinosa 2-4 μm lata circumcinctae.

HOLOTYPUS: U. S. A. TEXAS: Brewster County, roadside 2.9 miles from U. S. Hwy. 385 on road to Chisos Mountain Basin, *in foliis mortuis Dasylirionis sp.*, 22 May 1993, Annette Ramaley 9312C, BPI 802371.

Ascomata (Fig. 3, A) immersed, subepidermal, oblong, 275-350 μm broad, 350-600 μm long, and 250-420 μm tall, apex with a short, broad papilla, clypeus dark, over one to a few ascomata; peridium 25-35 μm thick, soft, composed of

5-8 layers of small, dark reddish brown pseudoparenchymatous cells and a few layers of compressed hyaline cells at the interior, light brown or brown hyphae from the walls into the substrate. Asci 185-235 x 24-32 μm (Fig. 3, C), 2-8-spored, clavate. Pseudoparaphyses cellular. Ascospores 35.2-50.4 (-56) x 16-20 (-23.2) μm (Fig. 3, B), golden when young, becoming golden brown to dark brown, somewhat asymmetric, the top hemispore slightly broader than the bottom, sometimes slightly inequilateral, obovoid fusoid, tapered to the rounded ends, the base more bluntly rounded than the apex, apex sometimes with a small apiculus, finely foveolate, constricted at the A1 and A2 septa and often at other septa, 7(-10)-septate, longitudinally 1-2-septate, surrounded by gel coating 2-4 μm wide.

Montagnula mohavensis A. W. Ramaley *et* M. E. Barr, *sp. nov.*, Fig. 3, D.

Ascomata immersa, subepidermalia, globosa vel sphaeroidea, 425-750 μm diam, 425-600 μm elata, apex brevipapillatus, clypeus atrobrunnescens, ex tela plus minusve laxa hypharum e pariete superiore ascomatis ad epidermidem hospitis constans; peridium 30-40 μm crassum, ex 8-10 stratis cellularum subbrunnearum vel atrobrunnearum pseudoparenchymatarum et aliquot stratis cellularum hyalinarum depressarum internarum compositum, hyphae ex parietibus in substratum. Asci bitunicati, 190-300 x 24-32 μm, clavati vel subcylindrici, quadri- vel octospori. Pseudoparaphyses cellulosae. Ascosporae 40.8-52 (-60) x 17.6-22.4 (-24) μm, subbrunneae subrufobrunnescentes, aliquantum asymmetricae, hemispora supera leviter latior quam hemispora infera, inequilaterales, obovoideae fusoideae, versus extrema attenuata, extrema rotundata vel acuta, basis saepe apiculata, apex raro apiculatus, subtiliter foveolatae, A1 septo constrictae, minus septis alteris constrictae, 7(-10)-septatae, longitudinaliter 2-3-septatae, tunica gelatinosa 5-7 μm lata circumcinctae.

HOLOTYPUS: U. S. A. CALIFORNIA: San Bernardino County, roadside U. S. Hwy. 95, mile 343.1, *in foliis mortuis Yuccae mohavensis* Sarg., 14 April 1992, Annette Ramaley 9214, BPI 802372.

Ascomata immersed, subepidermal, globose to spheroid, 425-750 μm diam, 425-600 μm tall, apex with a short papilla, clypeus dark brown, consisting of a loose hyphal web from the upper wall of an ascoma to the host epidermis; peridium 30-40 μm thick, composed of 8-10 layers of light brown to very dark brown pseudoparenchymatous cells and a few layers of compressed hyaline cells at the interior, hyphae from the walls into the substrate. Asci 190-300 x 24-32 μm, clavate to nearly cylindric, 4- or 8-spored. Pseudoparaphyses cellular. Ascospores 40.8-52 (-60) x 17.6-22.4 (-24) μm (Fig. 3, D), light brown becoming slightly reddish brown, somewhat asymmetric, the top hemispore a little broader than the bottom, inequilateral, obovoid fusoid, tapered to the ends, ends rounded or acute, the base often with a small apiculus, the apex rarely apiculate, finely foveolate, constricted at the A1 septum, less so at the other septa, 7(-10)-septate, longitudinally 2-3-septate, surrounded by gel coating 5-7 μm wide.

The ascospores of *M. dasylirionis* and *M. mohavensis* are of similar length, ornamentation, and septation, but differ in color, width, and the location of the apiculus, when present. The ascomata of the two species differ in size, shape, color, and extent of the the clypeus. It is not known how the host may affect these characteristics. Since *Dasylirion* leaves have longitudinally oriented, thick fiber bundles, the size and shape of ascomata or conidiomata of immersed fungal taxa are likely to be altered or restricted.

Montagnula yuccigena A. W. Ramaley *et* M. E. Barr, *sp. nov.*, Fig. 3, E.

Ascomata immersa, subepidermalia, globosa vel sphaeroidea, 450-700 μm diam, perfusca; clypeus absens vel ex tela laxa hypharum e pariete superiore ascomatis ad epidermidem hospitis constans; peridium 30-45 μm crassum, ex 6-10 stratis cellularum perfuscarum vel atropurpureobrunnearum, hyphae abundae atropurpureobrunneae ex parietibus peridii in substratum. Asci bitunicati, 160-210 x 17.6-21.6 μm, clavati vel subcylindrici, quadri- vel octospori. Pseudoparaphyses cellulosae. Ascosporae 27.2-41.6 x 12-14.4 μm, asymmetricae, plerumque hemispora supera latior, obovoideae fusoideae, subbrunneae vel brunneae, crasse foveolatae, A1 septis et interdum septis alteris constrictae, 3-7(-9)-septatae, longitudinaliter 1(-2)-septatae, tunica gelatinosa 2-5 μm lata circumcinctae.

HOLOTYPUS: U. S. A. NEW MEXICO: Colfax County, roadside, mile 229.9 U. S. Hwy. 64, *in foliis mortuis Yuccae baccata* Torr., 10 May 1993, Annette Ramaley 9305, BPI 802370.

Ascomata immersed, subepidermal, globose or spheroid, 450-700 μm diam, very dark brown; clypeus absent or consisting of a loose hyphal web from the upper wall of the ascoma to the host epidermis; peridium 30-45 μm thick, composed of 6-10 layers of very dark brown to dark purplish brown pseudoparenchymatous cells, abundant dark purplish brown hyphae from the wall of the peridium into the substrate. Asci 160-210 x 17.6-21.6 μm, clavate to nearly cylindric, four- or eight-spored. Pseudoparaphyses cellular. Ascospores 27.2-41.6 x 12-14.4 μm (Fig. 3, E), asymmetric, the top hemispore usually broader, obovoid fusoid, the ends acute or obtuse, inequilateral, light brown to brown, coarsely foveolate, constricted at the A1 septum and sometimes other septa, 3-7(-9)-septate, longitudinally 1(-2)-septate, surrounded by gel coating 2-5 μm wide.

Chaetoplea rosipapilla A. W. Ramaley *et* M. E. Barr, *sp. nov.*, Fig. 2, F, G.

Ascomata immersa, subepidermalia, plerumque gregaria, globosa, 200-375 μm diam, apex latipapillatus, papilla rosipigmentifer apice, periphysibus, clypeus ex hyphis laxis brunneis epidermide super unum vel aliquot ascomata compositus; peridium 20-25 μm crassum, ex 4-6 stratis cellularum brunneoparietum et 1-3 stratis cellularum hyalinarum depressarum compositum, hyphae brunneae ex peridio in substratum, unum vel plus quam unum ascomata cingentes. Asci bitunicati, 75-110 (-188) x 16-21.6 μm, plerumque octospori, clavati vel late subcylindrici. Pseudoparaphyses anguste cellulosae. Ascosporae 19.2-30.4 x 8-14.4 μm aureofulvae brunnescentes,

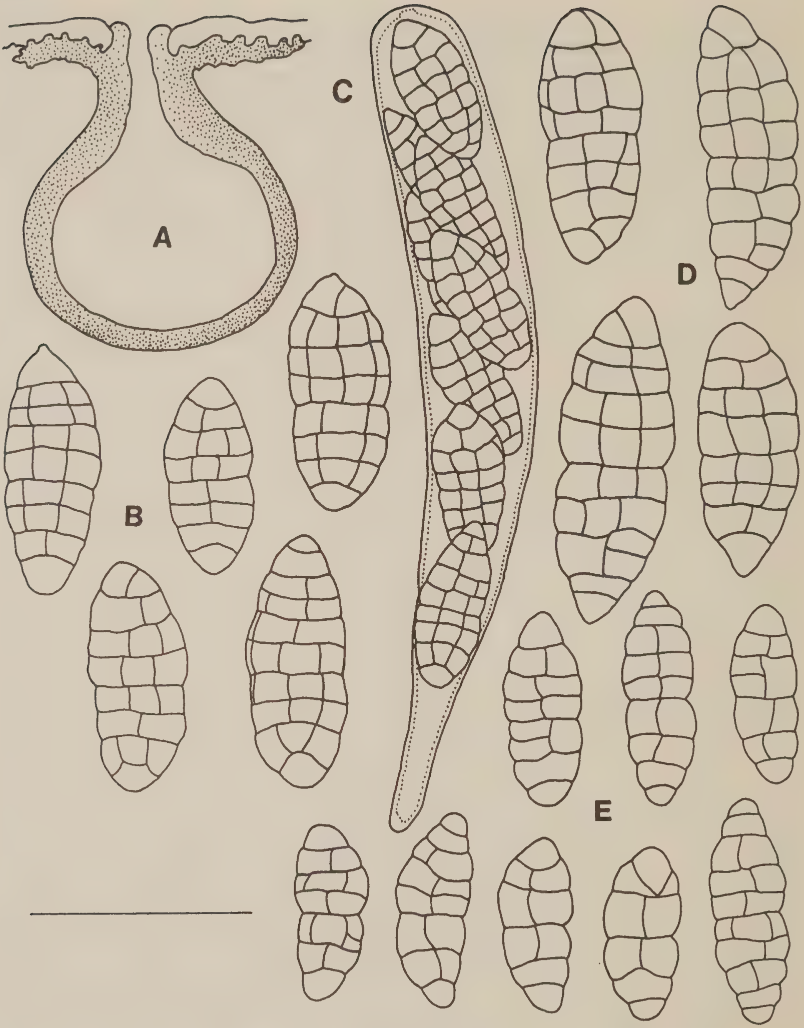

Figure 3. *A-C.* *Montagnula dasylirionis*: A, ascoma in vertical section; B, ascospores; C. ascus. D. *Montagnula mohavensis*, ascospores. E. *Montagnula yuccigena*, ascospores. Standard line: A=240 μm; B, D, E=40 μm; C=60 μm.

symmetricae vel hemispora supera latior, extrema obtuse rotundata, plus minusve truncatae quando cellulae terminales septatae sunt, equilaterales, unum septum

longitudinalum una cellula media usque ad cellulis omnibus, subtiliter foveolatae vel leves, 3-5-septatae, tunica gelatinosa 4-5 μm lata circumcinctae.

HOLOTYPUS: U. S. A. COLORADO: La Plata County, Durango, Fort Lewis College Campus at south end of picnic grounds, *in foliis mortuis Yuccae harrimaniae* Trel., 6 October 1993, Annette Ramaley 9317, BPI 802380. Paratype: La Plata County, Durango, Fort Lewis College Campus at south end of picnic grounds, dead leaves of *Yucca harrimaniae* Trel., 15 October 1990, Annette Ramaley 9019, COLO 489409.

Ascomata immersed, subepidermal, usually gregarious, globose, 200-375 μm diam, apex broadly papillate, the papilla with a rosy pigment at the tip, periphysate, clypeus composed of loose brown hyphae on the epidermis over one or a few ascomata; peridium 20-25 μm wide, composed of 4-6 layers of brown-walled cells and 1-3 layers of flattened hyaline cells, brown hyphae from the peridium into the substrate may envelop more than one ascoma. Asci 75-110 (-188) x 16-21.6 μm (Fig. 2, F), mostly 8-spored, clavate to nearly broadly cylindric. Pseudoparaphyses narrowly cellular. Ascospores 19.2-30.4 x 8-14.4 μm (Fig. 2, G), golden yellow brown becoming brown, symmetric or the upper hemispore broader, ends bluntly rounded, more or less truncate when end cells are septate, equilateral, a single longitudinal septum in one mid cell to all cells, finely foveolate to smooth, 3-5-septate, surrounded by gel coating 4-5 μm wide.

The clypeus of *Chaetoplea rosipapilla*, obvious over a young ascoma, consists of loosely woven brown hyphae on the underside of the host epidermis. During maturation and aging, the clypeus often becomes less distinguishable. Ascospore size, shape, and longitudinal septation are extremely variable from one ascoma to another, or even within the same ascoma. When the end cells are undivided, the ascospores are more or less ellipsoid or slightly obovate. When both end cells are divided the ascospores may be nearly rectangular (Fig. 2, G). The definite papilla, small-celled peridium, scarcely ornamented and slightly compressed ascospores, and the aged substrate suggest this species is better placed in *Chaetoplea* than in *Montagnula* or *Pleospora*.

Pleospora nolinae A. W. Ramaley *et* M. E. Barr, *sp. nov.*, Fig. 4, F-H.

Ascomata immersa, subepidermalia, oblonga, 150-300 μm lata, 175-375 μm longa, usque ad 250 μm elata, papilla brevi, lata; peridium 15-25 μm crassum, ex 4-6 stratis cellularum pseudoparenchymatarum compositum, strata exterior atrobrunnea, strata introrsum pallidior, hyphae subbrunneae ex parietibus in substratum. Asci bitunicati, 110-145 x 28-34 μm, quadri- vel octospori, clavati. Pseudoparaphyses cellulosae. Ascosporae biseriatae in asco, 28-40 x 12-16 μm, leves, luteae, brunnescentes, plerumque obovoideae et subtiliter inequilaterales, hemispora supera saepe parum latior et brevior quam hemispora infera, extrema rotundata, A1 et A2 septis et interdum septis alteris constrictae, (5-)7(-8)-septatae, longitudinaliter 1-2-septatae, tunica gelatinosa 2-5 μm lata circumcinctae.

HOLOTYPUS: U. S. A. NEW MEXICO: Chaves (?) County, roadside, U. S. Hwy. 380-70, mile 302.05, *in foliis mortuis Nolina* sp., 24 October 1993, Annette Ramaley, 9325, BPI 802382.

Ascomata immersed, subepidermal, oblong, 150-300 μm wide, 175-375 μm long, up to 250 μm tall, with a short, broad papilla; peridium 15-25 μm thick, composed of 4-6 layers of pseudoparenchymatous cells, the outer layers dark brown, the inner layers lighter, light brown hyphae from the wall into the substrate. Asci 110-145 x 28-34 μm, (4-)8-spored, clavate (Fig. 4, H). Pseudoparaphyses cellular. Ascospores biseriate in the ascus, 28-40 x 12-16 μm, smooth, golden, browning in age, mostly obovoid and slightly inequilateral, the top hemispore a little shorter and broader than the bottom hemispore, ends obtuse, constricted at the A1 and A2 and sometimes other septa, (5-)7(-8)-septate (Fig. 4, F, G), longitudinally 1-2-septate, surrounded by gel coating 2-5 μm wide.

This species belongs in the vicinity of *Pleospora herbarum* (Pers.:Fr.) Rabenh. but does not fit any of the synonymous names (12). No anamorph developed in culture.

Camarosporium species were found on *Agave lecheguilla* Torr. and *Agave americana* L. that were clearly different from each other and from the two species already described here, with their teleomorphs, on other members of the Agavaceae. The species from *Agave* have not been connected to a perfect state. Since *Camarosporium* contains about 400 names, mostly based on host specificity (11), it may not be thought desirable to add to the list. However, until the genus is revised using considerations other than host specificity, and including the teleomorphs, individuals that occur in new places need to be described in modern terms so they may be properly placed when the genus is re-worked.

Camarosporium agavensis A. W. Ramaley *et* M. E. Barr, *sp. nov.*, Fig. 4, D, E.

Conidiomata pycnidia, amphigena, immersa, subepidermalia, sphaeroidea, atrobrunnea, unilocularia, vertices complanati contra epidermidem hospitis, 175-400 μm diam; paries 25-35 μm crassus, ex 4-6 stratis cellularum pallidarum vel atrarum pseudoparenchymaticarum et 0-2 stratis cellularum hyalinarum interiorum compositus; aliquot hyphae ex parietibus in substratum. Ostiolum singulare, circulare, centrale, canalis ca 25 μm diam, papilla parva epidermis hospitis penetrans. Cellulae conidiogenae determinatae vel indeterminatae, discretae, leves, hyalinae, ampulliformes vel doliiformes vel brevicylindraceae, ex cellulis interioribus parietis conidiomatis formatae. Macroconidia 17.6-24.8 x 8.8-12 μm, plerumque ellipsoidea vel clavata, apex obtusus, basis aliquantum truncata vel obtuse rotundata, fulva, muriformia, crasse foveolata, aliquantum constricta septis, 3-5-septata. Ontogenesis conidiis holoblastica constructione ad parietes apicalem; proliferatio cellularum conidiogenarum enteroblastica; conidia addita ad idem punctum vel ad puncta successiva altiora producentia. Microconidia 3.2-5.6 μm diam, prope ostiolo et in canale ostioli formata, ca globosa, levia, hyalina, aseptata.

HOLOTYPUS: U. S. A. TEXAS: Brewster County, U. S. Hwy. 385 just outside the entrance to Big Bend National Park, *in foliis mortuis Agavis lecheguilla* Torr., 22 May 1993, Annette Ramaley 9310, BPI 8023376. Paratype: U. S. A. TEXAS: Culberson County, roadside, Hwy. 54, 2.2 miles south of gateway to Baylor Mountain Ranch, *in foliis mortuis Agavis lecheguilla* Torr., 21 October 1993, Annette Ramaley 9321, NY.

Conidiomata pycnidial, immersed, subepidermal, spheroid, dark brown, unilocular, the top flat against the host epidermis, 175-400 μm diam; the wall 25-35 μm thick, composed of 4-8 layers of light to dark brown pseudoparenchymatous cells and 0-2 layers of hyaline cells at the interior; some hyphae from the walls into the substrate. Ostiole single, circular, central, the channel ca 25 μm diam, the small papilla penetrating the host epidermis. Conidiogenous cells determinate or indeterminate (Fig. 4, D), discrete, smooth, hyaline, ampulliform to doliiform to short cylindric, formed from the inner cells of the pycnidial wall. Macroconidia 17.6-24.8 x 8.8-12 μm (Fig. 4, E), mostly ellipsoid or clavate, apex obtuse, base somewhat truncate or bluntly rounded, yellow brown, muriform, coarsely foveolate, somewhat constricted at the septa, 3-5-septate. Conidial ontogeny holoblastic by apical wall building; conidiogenous cell proliferation enteroblastic; additional conidia produced at the same level or at successively higher levels. Microconidia 3.2-5.6 μm, formed near the ostiole and in the ostiolar channel, approximately globose, smooth, hyaline, aseptate.

Conidia of *Camarosporium nolinae* and *C. agavensis* are of similar size, ornamentation, and number of transverse septa. The two can be separated by differences in color and the lack of longitudinal septa in some conidia of *C. nolinae.* In addition, the wall fragment remaining on the conidiogenous cells after secession of a *C. agavensis* conidium is narrow (Fig. 4, D), while in *C. nolinae* the fragment may be narrow or quite broad (Fig. 2, E).

Camarosporium agavifoliorum A. W. Ramaley *et* M. E. Barr, *sp. nov.*, Fig. 4, A-C.

Conidiomata pycnidia, amphigena, immersa subepidermalia, separata vel aggregata, unilocularia, globosa vel formata aliquantum irregulariter, atrobrunnea, 200-400 μm diam; paries 30-50 μm crassus, ex 4-8 stratis cellularum pseudoparenchymaticarum dilute vel atroparietibus compositus, pallidior introrsum, aliquando hyphis abundis in substratum. Ostiolum singulare, circulare, centrale, papilla crassa penetranti et rumpenti epidermis hospitis. Cellulae conidiogenae determinatae, discretae, doliiformes vel brevicylindratae, leves, hyalinae, ex cellulis interioribus parietis conidiomatis formatae. Macroconidia 12-18.4 x 7.2-9.6 μm, ellipsoidea vel clavata, extrema ambo obtuse rotundata vel basis truncata, fulva, muriformia, in- vel subconstricta septis, foveolata vel levia, 2-4-septata. Ontogenesis conidiis holoblastica constructione ad parietes apicalem; proliferatio cellularum conidiogenarum enteroblastica; conidia addita ad idem punctum producens. Microconidia 3.2-6.4 μm diam, prope ostiolo et in canale ostioli formata, globosa, levia, hyalina, aseptata.

HOLOTYPUS: U. S. A. TEXAS: Gillespie County, Fredricksburg, ornamental planting on Industrial Loop, *in foliis mortuis Agavis americana* L., 20 October 1993, Annette Ramaley 9319, BPI 802375.

Conidiomata pycnidial (Fig. 4, A), amphigenous immersed, subepidermal, separate or aggregated, unilocular, globose or somewhat irregularly shaped, dark brown, 200-400 μm diam; the wall 30-50 μm thick, composed of 4-8 layers of light- to dark-walled pseudoparenchymatous cells, becoming paler toward the interior, sometimes with abundant hyphae into the substrate. Ostiole single, circular, central, with a thick papilla breaking and penetrating the host epidermis. Conidiogenous cells determinate (Fig. 4, B), discrete, doliiform to short-cylindric, smooth, hyaline, formed from the inner cells of the conidiomatal wall. Macroconidia 12-18.4 x 7.2-9.6 μm (Fig. 4, C), ellipsoid to clavate, both ends bluntly rounded or the base truncate, yellow brown, muriform, not or only slightly constricted at the septa, foveolate or smooth, 2-4-septate. Conidial ontogeny holoblastic by apical wall building; conidiogenous cell proliferation enteroblastic; additional conidia produced at the same level. Microconidia 3.2-6.4 μm diam, formed near the ostiole and in the ostiolar channel, spherical, smooth, hyaline, aseptate.

Conidiomata of *Camarosporium agavifoliorum* often occur singly or in small groups on old stromata of a *Piptarthron* species. These conidiomata generally have few hyphae extending from the wall and are sometimes irregularly shaped. As in other *Camarosporium* species, old conidiomata often form aberrant conidia, at times considerably larger (20-24 x 8-10 μm) and with more septa (5-6-7) than in younger conidiomata with active conidiogenesis in progress.

The *Camarosporium* species described here illustrate the heterogeneous nature of the genus. The conidiogenous cells of *C. agavifoliorum* are 'phialides,' amd those of *C. yuccaesedum*, *C. nolinae*, and *C. agavensis* may, apparently, be 'annellides' or 'phialides' or both. The two sorts of conidiogenous cells differ only in the level at which additional conidia secede from the apex (6), but the difference has been one basis for separating whole groups of fungi (8), and subdividing large, heterogeneous taxa. It may not prove convenient for dividing *Camarosporium* into additional genera. The variation shown for *C. yuccaesedum*, *C. agavensis*, and *C. nolinae* conidiogenous cells is not present in each conidioma, nor has it been observed in all collections of *C. agavensis*. As additional conidiomata or further collections of *C. agavifoliorum* are examined, the presence of 'annellides' would not be too surprising. Since potential for variation of the level of conidial secession from the conidiogenous cell is clearly present in these *Camarosporium* species, a classification in which 'annellide' or 'phialide' is used in an exclusive manner, when only a few conidiomata or a single collection is examined, would seem inadvisable.

Acknowledgements: Our thanks to the National Fungus Collections for the loan of the type of *Camarosporium yuccaesedum*, and to Emory Simmons for his careful review of the manuscript, his helpful comments and apt suggestions.

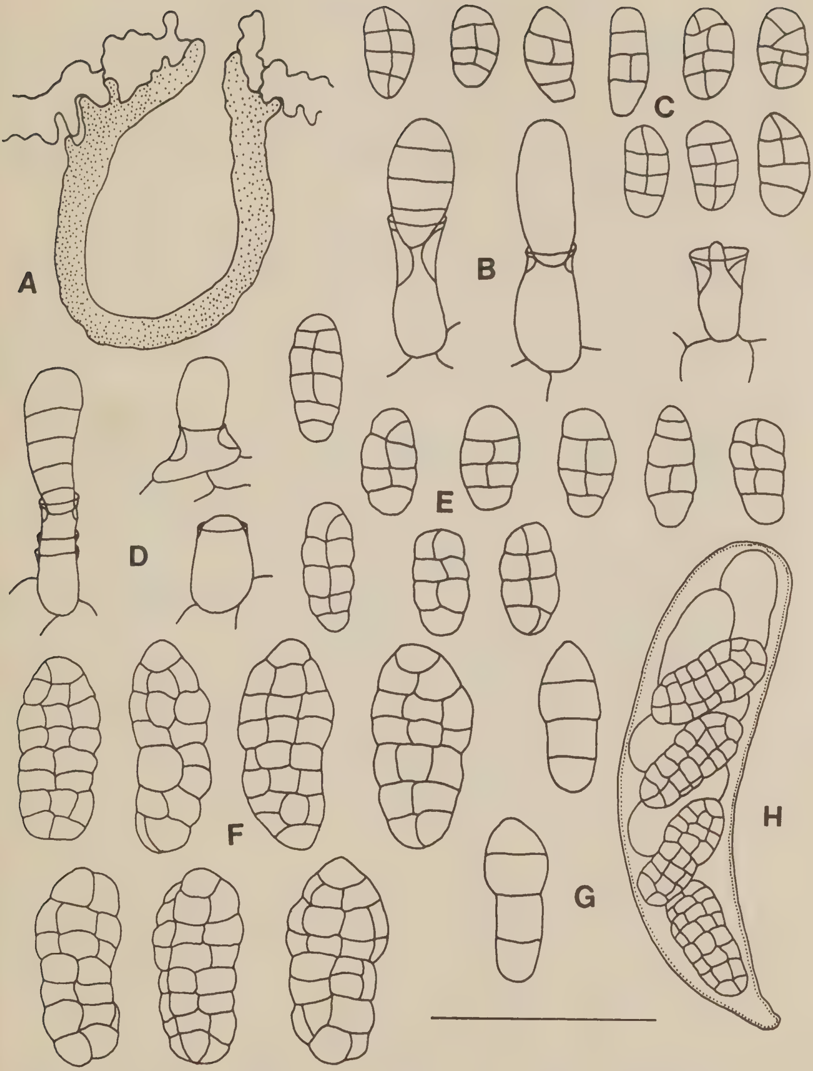

Figure 4. A-C. *Camarosporium agavifoliorum*: A, conidioma in vertical section; B, conidiogenous cells; C, conidia. D, E. *Camarosporium agavensis*: D, conidiogenous cells; E, conidia. F-H. *Pleospora nolinae:* F, mature ascospores; G, young ascospores showing the shorter, broader upper hemispore; H, ascus. Standard line: A=240 μm; B, D=30 μm; C, E=40 μm.

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REEXAMINATION OF SPECIES OF *LEPTOSPHAERIA* ON ASTERACEOUS HOSTS

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ABSTRACT

Type and other specimens of ten nominal taxa included in *Leptosphaeria* and described from hosts in the Asteraceae were reexamined. The placement of *L. carduorum* and *L. dolioloides* in *Ophiobolus* and *Nodulosphaeria*, respectively, is confirmed. *Leptosphaeria agnita* var. *ambigua* is combined in *L. agnita* while *L. agnita* var. *chrysanthemi* is elevated to species level as *L. chrysanthemicola*. The placement of *L. helminthospora, L. plurisepta*, and *L. tetonensis* in *Leptosphaeria* is supported. All of the foregoing taxa are illustrated.

Key words: *Leptosphaeria*, Asteraceae, Loculoascomycetes

In a recent literature review of the genus *Leptosphaeria* (Crane & Shearer, 1991), the greatest number of species described from hosts in a single flowering plant family was for the Asteraceae. As part of an ongoing taxonomic revision of the genus *Leptosphaeria*, specimens of seven taxa in *Leptosphaeria* described from asteraceous hosts were reexamined.

MATERIALS AND METHODS

Specimens were fixed in glutaraldehyde, embedded in Ultra Low Viscosity Resin and sectioned for light microscopy (Huhndorf, 1991) at about 3 µm thickness. Sections were stained with Toluidine Blue and preserved permanently on microscope slides in a 1:1 Permount-Xylene mix. Squash mounts of the ascomata were made in water which was replaced with lactic acid containing Azure A. India ink in water was used to detect gelatinous sheaths and appendages.

TAXONOMY

Ophiobolus acuminatus (Sow.:Fr.) Duby in Rabenh., Klotz. Herb. v. Mycol. ed. 2, Cent. 2, No. 57. Anno 1855. Figs. 1-6

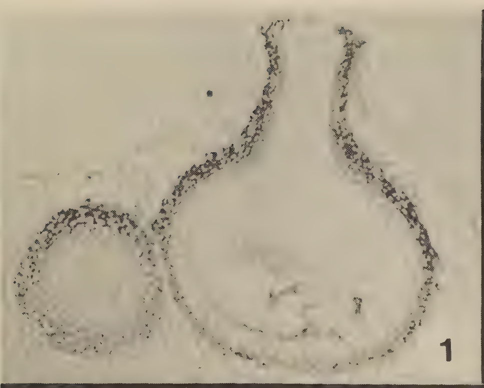
≡ *Sphaeria acuminata* Sow.: Fr., Syst. Mycol. Fung. 2:506. 1823.
= *Leptosphaeria carduorum* (Wallr.) Ces. & de Not., Comm. Soc. Critt. 1:235. 1863.
≡ *Sphaeria carduorum* Wallr. Fl. Crypt. Germ. 2:805. 1833.

Ascomata immersed becoming erumpent, globose, papillate, glabrous, 270-330 µm diameter, 340-390 µm high (Fig. 1). Ascomal wall of *textura angularis* in surface view (Fig. 2); in longitudinal section uniformly 23-30 µm thick, composed of two layers of elongate, pseudoparenchymatic cells 7-16 x 4-5(-8) µm, outer cell layer melanized brown, 3-4 cells thick, inner layer hyaline, 2-3 cells thick (Fig. 3). Papilla cylindrical, 100-125 µm high, 75-110 µm wide, surrounding an ostiole 43-63 µm wide, periphysate. Pseudoparaphyses 2 µm wide, sparse, cellular, without guttule-like thickenings at septa (Fig. 5). Asci 118-133 x 10-13 µm, fissitunicate, cylindrical, apex rounded, with 8 ascospores in a spirally twisted fascicle (Fig. 4). Ascospores scolecosporous, disarticulating into part-spores. Part-spores curved, 64-100 x 2.2-3 µm, 8-15 septate, without constrictions at septa, first cell (from the point of disarticulation) with a distinct swelling, smooth walled (Fig. 6).

Material Examined: (GERMANY) Ad caules Carduorum siccos. Hyeme. HOLOTYPE of *Sphaeria carduorum* ex STR.

Müller (1952) synonymized *Sphaeria carduorum* with *Ophiobolus acuminatus*. We concur with his disposition. The fungus studied here is identical to *Ophiobolus acuminatus* except for two differences. The asci are much smaller than those given for *O. acuminatus* (Walker, 1980: 130-150 x 10-12 µm; Shoemaker, 1976: 150-190 x 13-17 µm). Also, in the holotype of *S. carduorum,* the part-spore has a swollen cell at the point of disarticulation whereas in *O. acuminatus* the second or third cell from the point of disarticulation is swollen. It is likely that the asci in the holotype material are not fully mature and hence are smaller, and that additional septa are laid down in the ascospore so that the swollen cell becomes the second cell from the primary septum. This is shown in an illustration by Walker (1980, Fig. 24).

Figs. 1-6. *Ophiobolus acuminatus* (from holotype of *Sphaeria carduorum*). 1. Longitudinal section through ascoma, x130. 2. Ascomal wall in surface view, x630. 3. Longitudinal section through ascomal wall, x1040. 4. Ascus, x570. 5. Pseudoparaphyses, x1340. 6. Ascospore, x1250.



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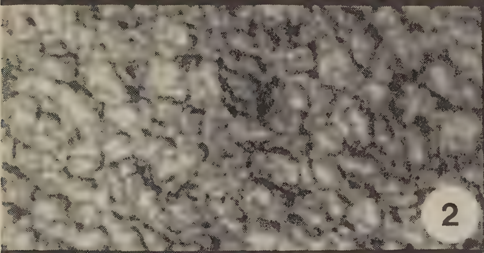

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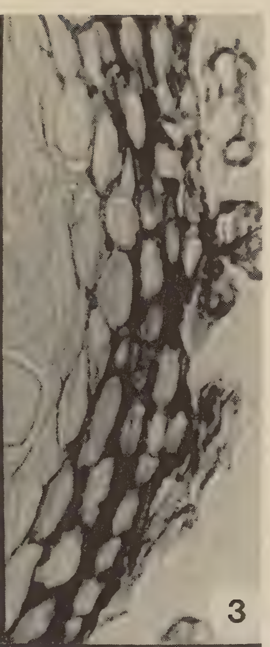

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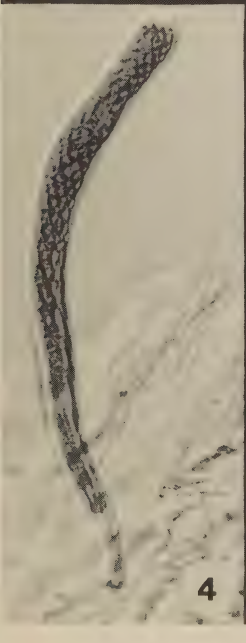

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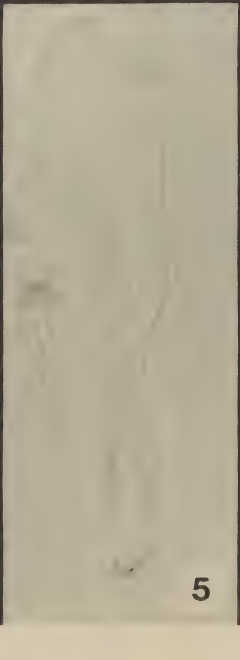

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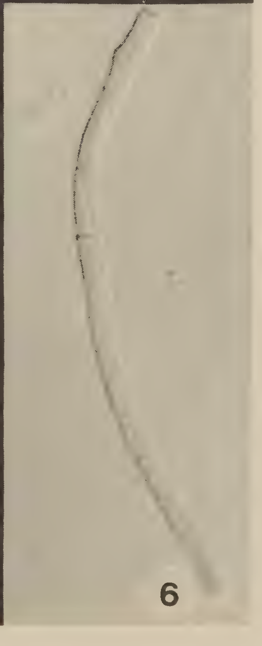

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Leptosphaeria agnita (Desmazieres) Ces. & de Not., Comment. Soc. Crittogam. Ital., Milan 1:236. 1863. Figs. 7-12

= *Leptosphaeria agnita* (Desm.) Ces. & de Not. var. *ambigua* Berlese, Atti dell'Accademia Scientifica Veneto-Trentino-Istriana, Padova, Series 1, 9:247-248. 1886.

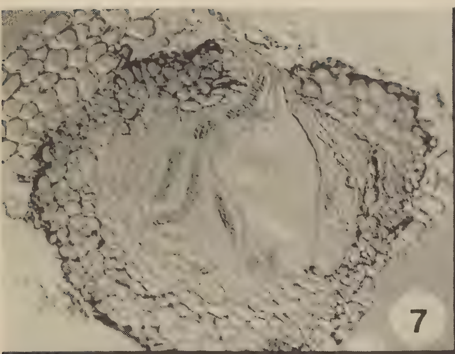
≡ *Leptosphaeria ogilviensis* (Berkeley & Broome) Ces. & de Not. forma *eupatorii-cannabini* Nom. nud., Comment. Soc. Crittogam. Ital., Milan 1:235. 1863.

Ascomata immersed, globose to slightly elongated, papillate , glabrous, 200-275 µm diameter, 213-282 µm high (Fig. 7). Ascomal wall of *textura angularis* in surface view (Fig. 11); in longitudinal section 30-43 µm thick, composed of two layers of scleroplectenchymatic cells, outer layer 3-4 cells in thickness, composed of thick-walled isodiametric cells, inner layer made up of 1-2 layers of thin-walled flattened cells (Fig. 9). Amorphous brown exudate deposited on outer cell walls of the ascoma. Papilla short, composed of 5-6 layers of small, brown pigmented, isodiametric cells 4.5-11 µm in diameter. Ostiole 33-42 µm wide, aperiphysate. Pseudoparaphyses 2.5-3.5 µm wide, cellular (Fig. 12). Asci fissitunicate, 83-135 x 9-15 µm, numerous, basal, cylindrical, with 8 overlapping triseriate ascospores (Fig. 10). Ascospores 33-40 x 4-5 µm, cylindrical, with rounded end cells, third cell enlarged, straight to slightly curved, 6-septate, smooth-walled without sheath or appendages (Fig. 8).

Material Examined: (GERMANY) Bavaria: Bayreuth in *Eupatorii cannabini* L. caulibus putridis, leg. de Thümen, 1875, Mycotheca Universalis, Cent. 7, No. 649. Anno 1877 (ILL), as *Leptosphaeria ogilviensis* forma *eupatorii-cannabini*. ISOTYPE of *Leptosphaeria agnita* var. *ambigua*, ex NY.

The diagnosis of *Leptosphaeria agnita* var. *ambigua* is based on Thümen's specimen no. 649, Mycotheca Universalis, under the name *Leptosphaeria ogilviensis* forma *eupatorii-cannabini*. Berlese (1886) noted the similarities of this taxon with *Leptosphaeria ogilviensis*, but based on the size of the perithecia and the number of septa in the ascospores (5 in *L. ogilviensis*) decided this should be a variety of *L. agnita*. The type material of *L. agnita* var. *ambigua* was not significantly different from *L. agnita*, and hence we relegate it to synonymy with *L. agnita*.

Figs. 7-12. *Leptosphaeria agnita* (from isotype of *L. agnita* var. *ambigua*). 7. Longitudinal section through ascoma, x280. 8. Ascospores, x1210. 9. Longitudinal section through ascomal wall, x1390. 10. Ascus, x750. 11. Ascomal wall in surface view, x490. 12. Pseudoparaphyses, x1430.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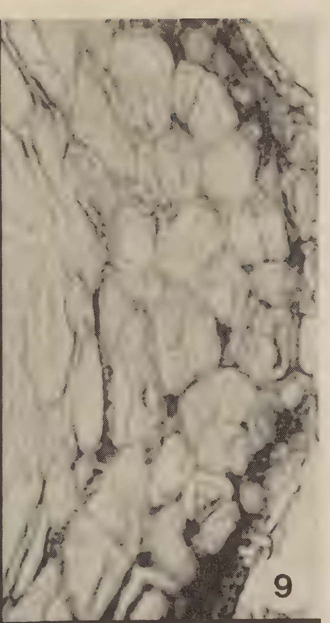
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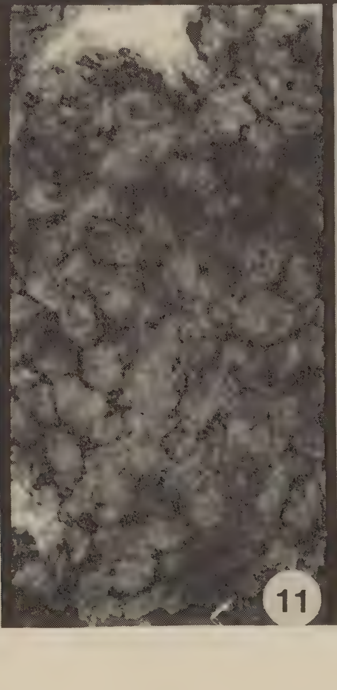
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Leptosphaeria chrysanthemicola Khashnobish, Shearer & Crane, nom. nov. Figs. 13-18

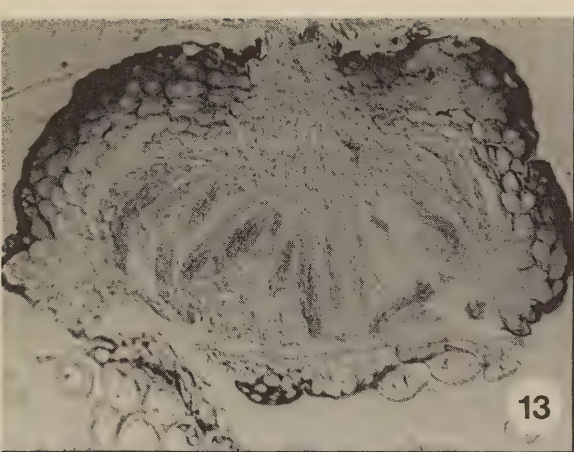
> =*Leptosphaeria agnita* (Desm.) Ces. & de Not. var. *chrysanthemi* Berlese, Atti dell' Accademia Scientifica Veneto-Trentino-Istriana, Padova, Series 1, 9:246-247. 1886.

Ascomata scattered, superficial, depressed-globose, glabrous, papilla lacking, 188 µm diameter, 130 µm high (Fig. 13). Ascomal wall of *textura prismatica* in surface view composed of cells radiating from apex outward (Fig. 14); in longitudinal section 25-35 µm wide laterally, 15 µm at base, 4-6 cells thick, composed of polygonal, scleroplectenchymatic cells (6-)8-11(-15) x 5-9 µm, outer cells melanized brown with external brown exudate except at the base of the ascoma. Ostiole circular, 20 µm wide with pseudoparaphyses protruding into ostiolar channel. Pseudoparaphyses numerous, cellular, frequently septate, 2.5-4 µm wide, broader at base, with cytoplasmic accumulations at septa (Fig. 16). Asci fissitunicate, 63-75 x 9-13 µm, numerous, in a broad basal hymenium, cylindro-clavate, with 8 triseriate ascospores (Fig. 15). Ascospores 30-40 x 4-5 µm, narrowly fusiform, apical cell broadly rounded, basal cell tapered, third cell enlarged, 5-septate, constricted only at primary septum, septa unevenly distributed, primary septum supramedian, ascospore with thin gelatinous sheath (Figs. 17, 18).

Material Examined: (GERMANY) Auf dürren Stengeln von *Chrysanthemum corymbosum* in einem jungen Eichenwald bei Sugenheim in Franken, leg. H. Rehm, July 1870, Ascomyceten No. 35, as *Leptosphaeria agnita*. ISOTYPE of *Leptosphaeria agnita* var. *chrysanthemi*, ex PAD.

This fungus on *Chrysanthemum* was considered to be a variety of *L. agnita* by Berlese (1886). This taxon, however, differs from *L. agnita* in that the ascomal wall in surface view is of *textura prismatica*, composed of cells radiating from the ascomal apex outward and the ascospores are consistently 5 septate. The ascomal wall in *L. agnita* is of *textura angularis* in surface view, and the ascospores are 6 septate. We feel that these differences are significant enough to remove this taxon from *L. agnita* and propose the name *Leptosphaeria chrysanthemicola* to accommodate this fungus. The variety name *chrysanthemi* was not used because it had been applied previously to another fungus, *L. chrysanthemi* Clements & Clements, and although it is a nomen nudum (Crane & Shearer, 1991), we elected to use another name to avoid confusion. *Leptosphaeria chrysanthemicola* is similar to *L. ogilviensis*, which also has 5 septate ascospores, but can be distinguished from the latter by the absence of globose

Figs. 13-18. *Leptosphaeria chrysanthemicola* (from isotype of *L. agnita* var. *chrysanthemi*). 13. Longitudinal section through ascoma, x400. 14. Ascomal wall in surface view, x270. 15. Asci, x330. 16. Pseudoparaphyses, x1040. 17. Ascospores, x650. 18. Single ascospore, x910.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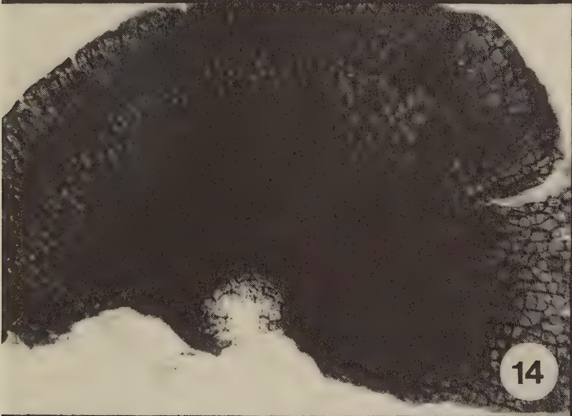
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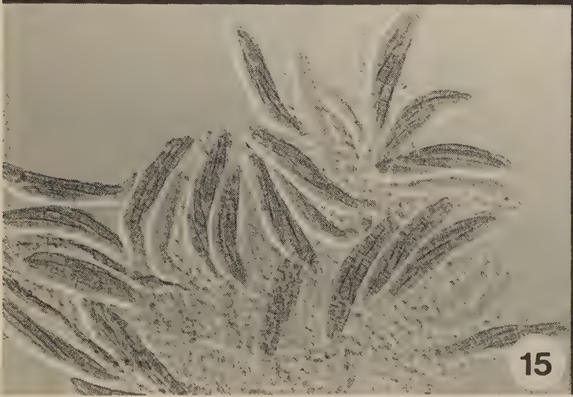
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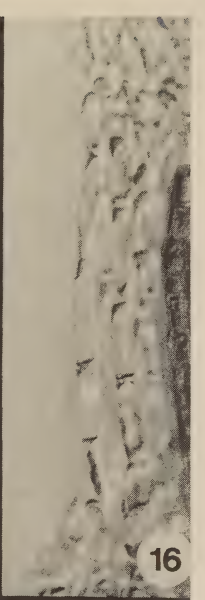
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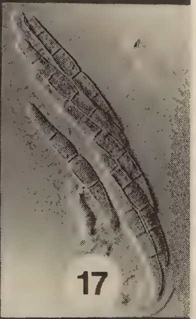
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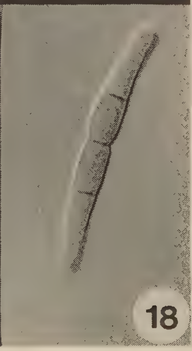
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appendages at the ascospore apices, and the occurrence of radially aligned cells of the ascomal wall in surface view in *L. chrysanthemicola*.

Nodulosphaeria dolioloides Auersw. in Rabenh., Fungi Europ. Exsic., Klotz. Herb. v. Mycol. Contin. Ed. Nova, Ser. Sec., Cent. 6, No. 547. 1863.
Figs. 19-26

≡ *Pleospora dolioloides* (Auersw.) Fuckel, Symbolae Mycologicae, p. 138. 1870.

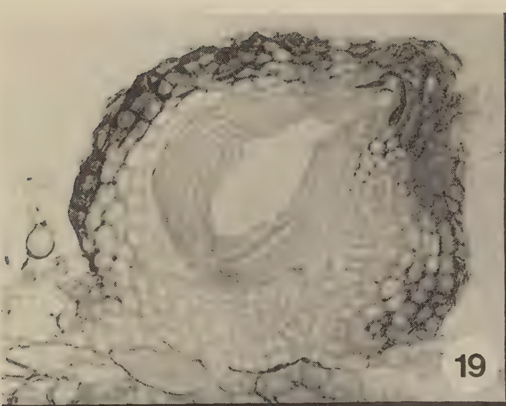
≡ *Leptosphaeria dolioloides* (Auersw.) Karsten, Mycol. Fenn. Pars 2, Pyren., pp. 106-107. 1873.

Ascomata scattered, superficial, globose, papillate, with some brown hairs externally, 180-275 µm diameter, 190-270 µm high (Fig. 19). Ascomal wall of *textura angularis* in surface view (Fig. 26); in longitudinal section uniformly 22-35 µm thick, composed of 3-6 polygonal, pseudoparenchymatic cells 9-28 x 4-8 µm, outer layer of cells melanized brown with orange colored exudate deposited externally (Fig. 24). Papilla short, composed of small, isodiametric cells; with smooth, brown, septate hairs 4-5 µm wide in ostiolar channel. Pseudoparaphyses 2.5-3 µm wide, cellular, without guttule-like thickenings at septa (Fig. 25). Asci fissitunicate, 78-108 x 10-12.5 µm, numerous, in a broad basal hymenium, cylindro-clavate, apex rounded, with 8 ascospores, tetraseriate above, fewer below (Fig. 23). Ascospores 40-51 x 4.5-5.5 µm, fusiform, slightly curved, with acute end cells, fourth cell enlarged, 7-10 septate, septa unevenly distributed, primary septum supramedian, with constrictions at mid-septum only, smooth, with thin, uniform gelatinous sheath (Figs. 20-22).

Material Examined: Fungi Europaei Exsiccati, Klotzschii Herbarii vivi Mycologici Continuatio Edita Nova, Series Secunda, Century 6, No. 547, HOLOTYPE of *Nodulosphaeria dolioloides*, ex FH. Fungi Fenniae Exsiccati, Cent. 10, No. 978, Anno 1870, non typus, ex FH.

The material examined accords well with the descriptions by Holm (1957) and Müller (1950). Measurements of asci and ascospores given by Shoemaker (1984, asci 70-85 x 12-16 µm, ascospores 36-42 x 5.5-6.5 µm) are, however, at the shorter end of the range observed in the material used in this study. Also Shoemaker reported no external crust on the ascoma whereas we found a thick orange colored deposit.

Figs. 19-26. *Nodulosphaeria dolioloides* (from holotype of *Nodulosphaeria dolioloides*). 19. Longitudinal section through ascoma, x330. 20-22. Ascospores, x780. 23. Ascus, x810. 24. Longitudinal section through ascomal wall, x580. 25. Pseudoparaphyses, x1140. 26. Ascomal wall in surface view, x1390.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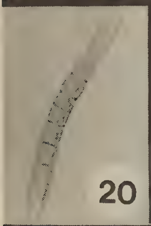
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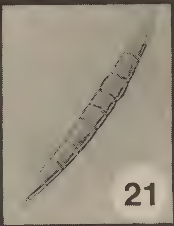
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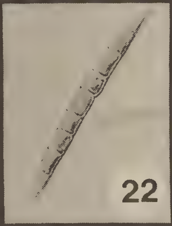
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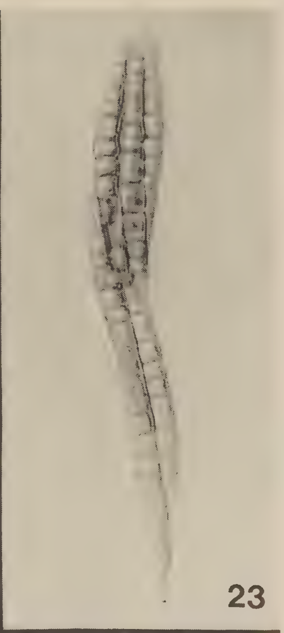
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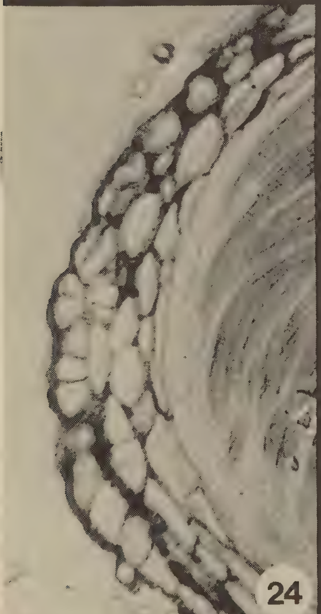
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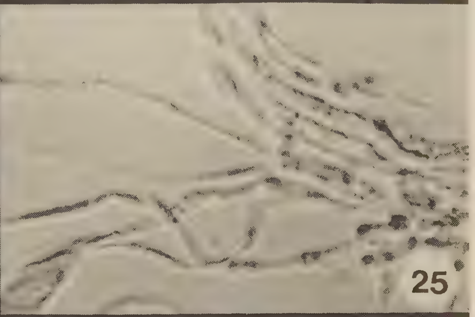
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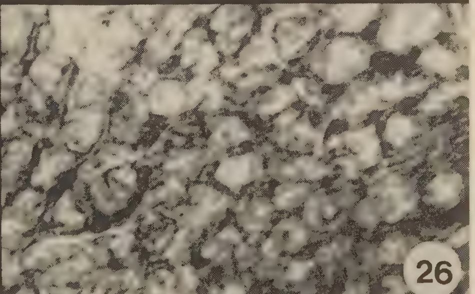
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Leptosphaeria helminthospora (Cesati in Rabenh.) Ces. & deNot., Comment. Soc. Crittogam. Ital. 1. Part IV: pp.177-240. 1863.

Figs. 27-33

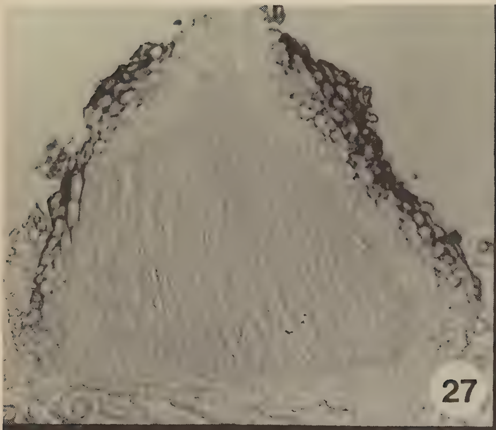
= *Leptosphaeria sydowiana* H. Rehm in P. Sydow, Mycotheca Marchica, Cent. 9, No. 849. Anno 1885. Nom. nud. Art. 32.1.

Ascomata superficial, conoid, without papilla, glabrous, 200-250 µm diameter, 170-195 µm high (Fig. 27). Ascomal wall of *textura angularis* in surface view (Fig. 33); in longitudinal section uniformly 16-25 µm thick, composed of a single layer of isodiametric, scleroplectenchymatic cells, 5-10 x 3-7 µm (Fig. 30). Wall 5-6 cells thick, outer 2-3 cells melanized brown, inner cells hyaline. Orange-brown exudate on surface of ascomal wall. Ostiole circular. Pseudoparaphyses 1.5-2.5 µm wide, numerous, cellular, with cytoplasmic accumulations at septa (Fig. 32). Asci fissitunicate, 105-138 x 13-24 µm, numerous, basal, cylindrical, short-stalked, with 8 overlapping bi- to triseriate ascospores (Fig. 31). Ascospores 44-50 x 8-10 µm, broadly fusiform above primary septum, sharply tapered below, 7-11 septate, primary septum supramedian, with constrictions at most septa, smooth (Figs. 28-29).

Material Examined: (GERMANY) Auf *Artemisia campestris*, Wilmersdorf bei Berlin, leg. P. Sydow, June 1885, Mycotheca Marchica, Cent. 9, No. 849, Anno 1885, as *Leptosphaeria sydowiana*, ex NY. Auf *Artemisia campestris* an einem Wege bei Schöneberg bei Berlin, leg. P. Sydow, June 1887, Mycotheca Marchica, Cent. 9, No. 1484, Anno 1887, as *Leptosphaeria sydowiana*, ex NY.

Holm (1957) noted the synonymy of *L. sydowiana* with *L. helminthospora*. This species has conoid ascomata with a peridium of scleroplectenchymatous cells. Shoemaker (1984) gave a good description of this fungus but described the walls as consisting of pseudoparenchymatous cells.

Figs. 27-33. *Leptosphaeria helminthospora* (from Mycotheca Marchica 849, as *Leptosphaeria sydowiana*). 27. Longitudinal section through ascoma, x340. 28, 29. Ascospores, x560. 30. Longitudinal section through ascomal wall, x1250. 31. Ascus, x720. 32. Pseudoparaphyses, x1040. 33. Ascomal wall in surface view, x420.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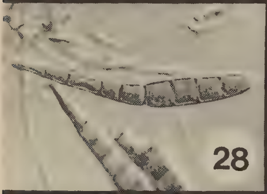
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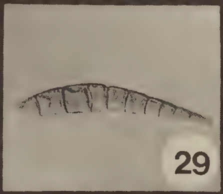
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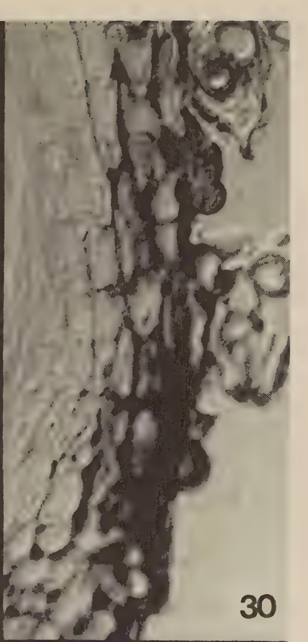
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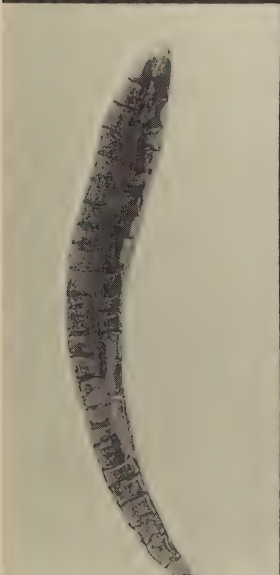
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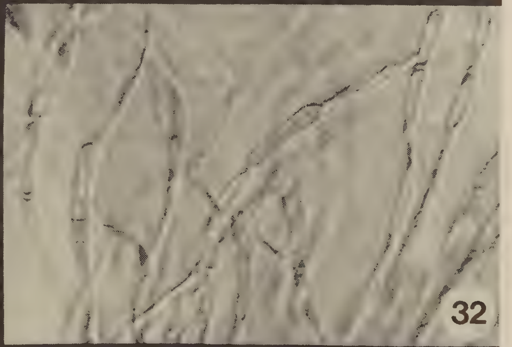
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Leptosphaeria plurisepta (Tehon & Daniels) J. A. v. Arx & E. Müller, Stud. Mycol., 9:76. 1975. Figs. 34-40

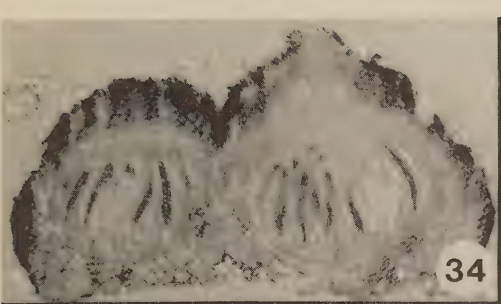
≡ *Exilispora plurisepta* Tehon & Daniels, Mycologia 19:113. 1927.

Ascomata superficial, globose, short papillate, glabrous, 315-330 µm diameter, 250-320 µm high (Fig. 34). Ascomal wall of *textura prismatica* in surface view, composed of cells radiating from apex outward (Fig. 35); in longitudinal section uniformly 37-43 µm thick, composed of three layers of scleroplectenchymatic cells (Fig. 36): outer layer 1-2 cells thick, cell walls melanized brown, middle layer of 3-4 isodiametric unpigmented cells, 9-22 x 6-12 µm, inner layer one cell thick, cells flattened, hyaline, 10-16 x 2-4 µm; different cell layers not evident at the base. Papilla short, truncate-conical, 45 µm high, 64 µm wide at the apex, 115 µm wide at the base, composed of 3-6 layers of small cells surrounding an ostiole 58 µm wide. Pseudoparaphyses 2-3 µm wide, numerous, cellular, without guttule-like thickenings at septa (Fig. 40). Asci fissitunicate, 103-120 x 13-15 µm, in a broad basal hymenium, cylindrical, apex rounded, with 8 ascospores in one fascicle (Fig. 37). Ascospores 82 x 5 µm, cylindrical, slightly curved, 13 or more septate, septa evenly distributed, with slight constrictions at all septa, smooth walled (Figs. 38-39).

Material Examined: (U.S.A., Illinois) On *Erigeron* sp., McNabb, Putnam County, leg. C.L. Porter, 28 June 1922, HOLOTYPE of *Exilispora plurisepta* , ILLS 8404.

This species was considered by Walker (1980) to be identical to *L. compressa*. Although measurements of the ascomata, asci and ascospores are similar in the two, morphological differences in the ascospores indicate that they are distinct. In Shoemaker's (1976) treatment of *Ophiobolus compressus*, illustrations and a photograph of the spores show a constricted primary septum with no constriction at most other septa, and enlargement of the cells immediately adjacent to the primary septum. Also, the cells of the ascospores are significantly longer than wide. Our examination of the isotype of *O. compressus* (Ascomyceten, Fascicle 4, No. 189, ex NY) confirms these observations. In the holotype of *Exilispora plurisepta*, constrictions were seen at many septa, no enlarged cells were observed, and the length to width ratio was much smaller than in Shoemaker's illustrations of *O. compressus*. The thick walled ascomata of *L. plurisepta* with polygonal, scleroplectenchymatic cells is very characteristic of *Leptosphaeria* and further distinguishes *L. plurisepta* from *O. compressus*.

Figs. 34-40. *Leptosphaeria plurisepta* (from holotype of *Exilispora plurisepta*). 34. Longitudinal section through ascomata, x130. 35. Ascomal wall in surface view, x320. 36. Longitudinal section through ascomal wall, x390. 37. Ascus, x800. 38, 39. Ascospores, x420. 40. Pseudoparaphyses, x910.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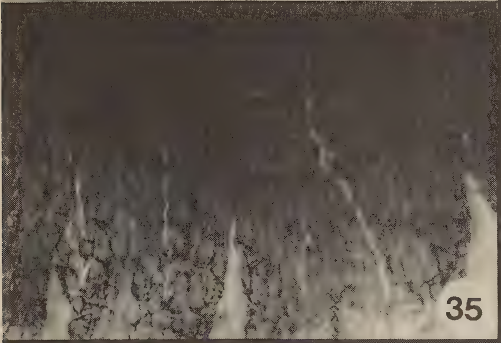
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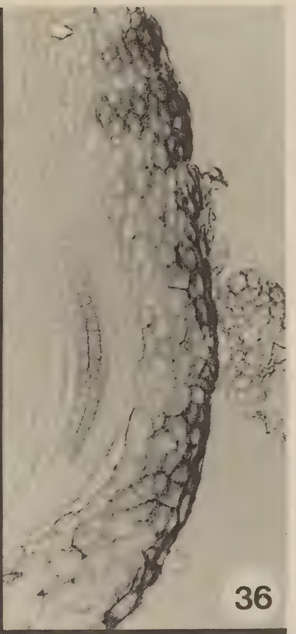
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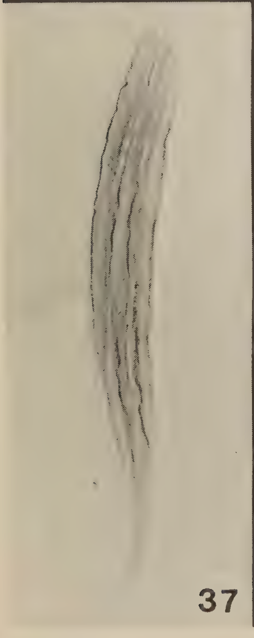
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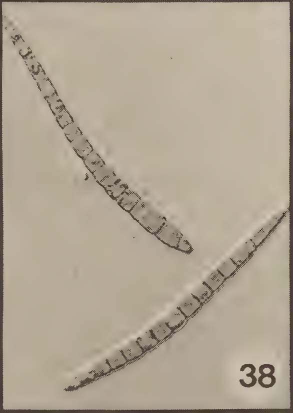
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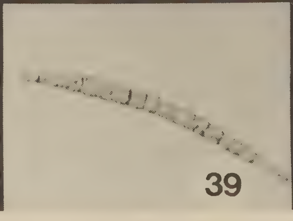
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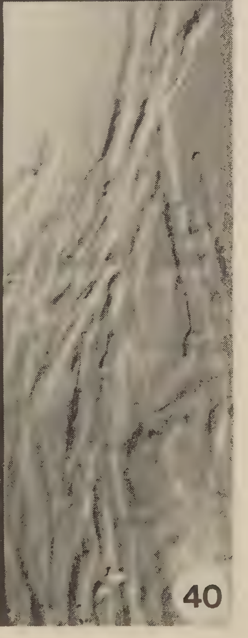
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Leptosphaeria tetonensis (Ellis & Everhart) Rehm, Ann. Mycol. 9:289. 1911.
Figs. 41-48

≡ *Melanomma tetonensis* Ellis & Everhart, Proc. Acad. Nat. Sci. Phil. 1890:240. 1890.

= *Syncarpella tetonensis* (Ellis & Everhart) Barr & Boise, Mem. New York Bot. Gard. 49:303. 1989.

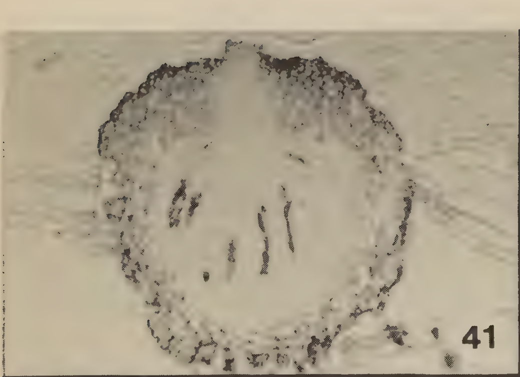
= *Melanomma nitidum* Ellis & Everhart, Bull. Torr. Bot. Club 25: 502. 1898.

Ascomata erumpent singly or in groups, globose, minutely papillate, glabrous, 320 µm diameter, 340 µm high (Fig. 41). Ascomal wall of *textura angularis* in surface view (Fig. 48); in longitudinal section 57 µm thick, thicker near ostiole 84 µm, composed of one layer of 6-7 isodiametric cells, melanized brown with orange-brown exudate on outer surface of wall (Fig. 44). Cells at the apex of the ascoma near the ostiole small, 7-10 x 5-7 µm, scleroplectenchymatic with very thick walls (Fig. 42). Cells mainly pseudoparenchymatic at sides and base of ascoma. Papilla punctate, surrounding a circular ostiole without periphyses. Pseudoparaphyses 2 µm wide, with septa at 13-20 µm intervals, numerous, narrowly cellular, with guttule-like thickenings at septa, some pseudoparaphyses growing into ostiole (Fig. 47). Asci fissitunicate, (75-)90-110 x 13-15 µm, numerous, basal, cylindro-clavate, apex rounded, with 8 biseriate ascospores (Fig. 43). Ascospores 26-31 x 7-9 µm, broadly fusiform, with rounded end cells, two inner cells larger than others, third cell slightly longer than fourth, straight to slightly curved, 5 septate, without constrictions or with slight constriction at mid-septum, smooth walled (Figs. 45, 46).

Material Examined: (U.S.A, Montana) On bark of *Artemisia cana*, in valley of the Teton river, July 1890, F.W. Anderson No. 551., HOLOTYPE of *Melanomma tetonensis* E. & E., ex NY. (U.S.A, Colorado) Grand Junction, 24 March 1898, C.S. Crandall 325, HOLOTYPE of *Melanomma nitidum* E. & E., ex NY.

Barr & Boise (1989) placed this species in *Syncarpella*. *Syncarpella* is distinguished by ascomata that are often seated on a common basal stroma or when occurring separately, have a peridium which is of even thickness or thicker at the base. Ascomata of *Leptosphaeria tetonensis* occur singly or in groups in which at times the ascomata are fused together. The peridium is smooth, uniformly thick laterally and at the base but thicker near the ostiole - a feature which is more indicative of *Leptosphaeria*. *Leptosphaeria tetonensis* shows few characters associated with *Syncarpella* and we

Figs. 41-48. *Leptosphaeria tetonensis* (from holotype of *Melanomma tetonensis*). 41. Longitudinal section through ascoma, x160. 42. Ascomal apex, x530. 43. Asci, x780. 44. Longitudinal section through ascomal wall, x630. 45, 46. Ascospores, x1160. 47. Pseudoparaphyses, x870. 48. Ascomal wall in surface view, x630.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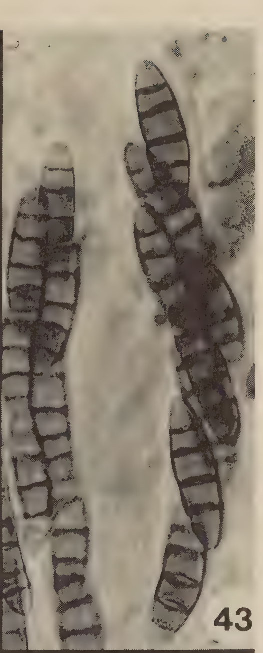
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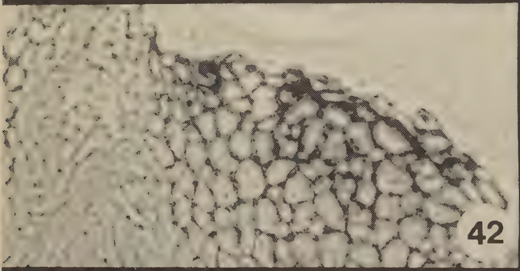
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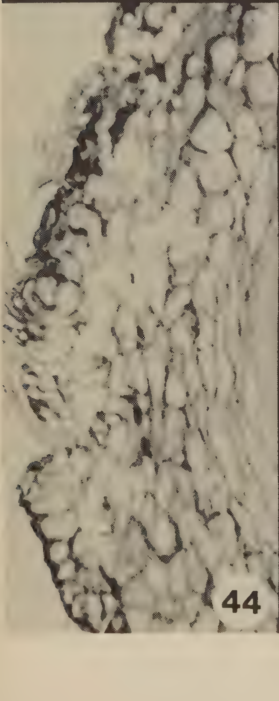
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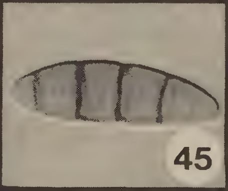
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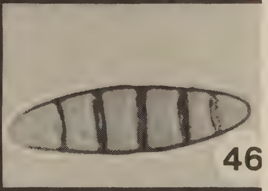
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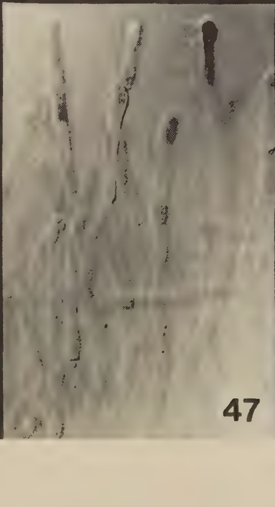
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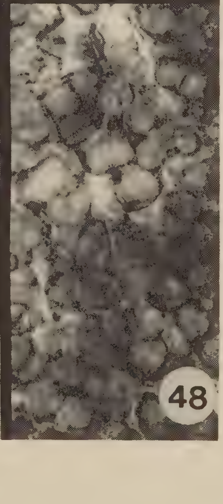
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therefore feel that this species is best placed in *Leptosphaeria*. Our description differs from that of Barr & Boise (1989) in that we found the upper hemispore to be slightly longer than the lower hemispore.

ACKNOWLEDGMENTS

We thank the curators of the various herbaria cited within for the loan of specimen for this study. Appreciation is expressed to the National Science Foundation (Grant BSR 87-00065) for financial support for this study. We also thank Sabine M. Huhndorf for kindly reviewing the manuscript.

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MYCOTAXON

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A NEW *CONIOCHAETA* FROM FRESH WATER

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ABSTRACT

A new species of *Coniochaeta* from wood submerged in a river is described and illustrated. This species differs from other *Coniochaeta* species in the distinctly reniform ascospores.

Key words: *Coniochaeta*, Ascomycetes, freshwater

INTRODUCTION

In connection with a latitudinal survey of the freshwater ascomycetes of North America, a fungus with the generic characteristics of *Coniochaeta* was found. A subsequent literature review of the species in *Coniochaeta*, including two recent keys (Hawksworth & Yip, 1981; Mahoney & La Favre, 1981), revealed that this fungus has not been described previously. A description of the new species follows.

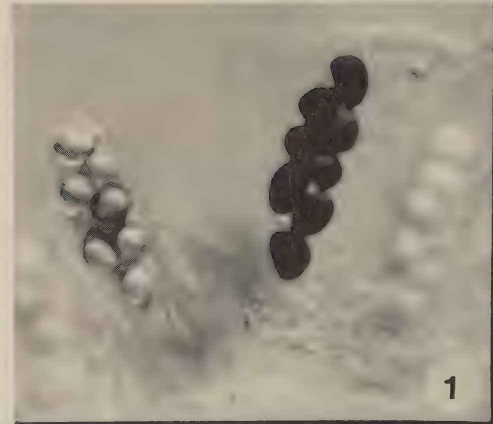
MATERIALS AND METHODS

Ascomata produced on incubated woody debris were fixed in glutaraldehyde, embedded in Ultra Low Viscosity Resin and sectioned for light microscopy (Huhndorf, 1991) at about 3 µm thickness. Sections were stained with Toluidine Blue and preserved permanently on microscope slides in a 1:1 Permount-xylene mix. Ascospores were prepared for SEM by air drying and mounting them on stubs and then coating them with gold and palladium. Squash mounts of the ascomata were made in water which was replaced with lactic acid containing Azure A.

TAXONOMY

Coniochaeta renispora Crane & Shearer sp. nov. Figs. 1 - 8.

Ascomata immersa, globosa, asetosa, ostiolata, 428-530 x 420-594 µm diam. Rostrum papillatum, 17-23 µm diam., pariete ex brunnea, crasse tunicata textura prismatica compositus. Peridium glabrum, pallide ex brunnea, tenui-tunicata, textura angulari in aspectu superficiali, in sectione longitudinali 6-10 stratis cellulis, 18-20 µm crassum. Cellulae tunicae pseudoparenchymaticae, formatae irregularibus, secundum radios compressae. Periphyses ex cellulis ovalibus vel pyriformibus compositae, constrictae ad septa, 15.5-20.0 (-27.0) x 2.2-3.3 µm. Paraphyses numerosae, filamentosae, multiseptatae, simplices, 94-100 (-104) x 2.0-2,2 µm. Asci unitunicati, octospori, cylindrici vel clavati sessiles, tenuiter-tunicati, sine apparatu apicali, deliquescentes, 34-



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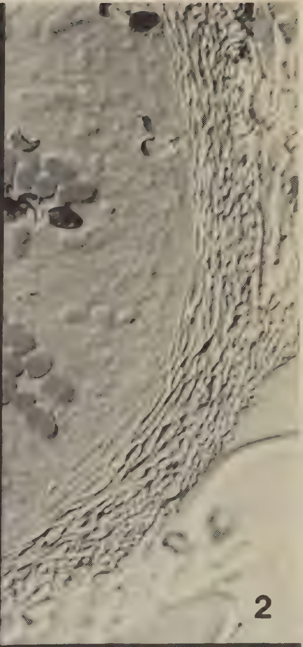

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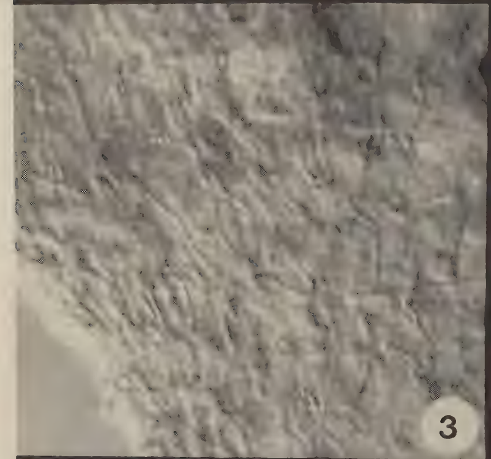

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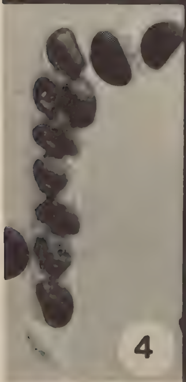

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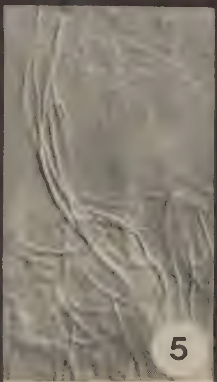

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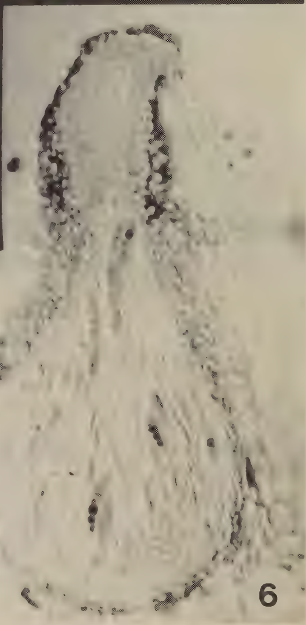


6

57 (-64) x 11.0-15.5 µm. Ascosporae extrusae et cumulati in tumulos nigros super substratum, irregulariter biseriatae, continuae, inaequilaterales, reniformes, raro lacrimiformes, obpyriformes, atrobrunneae, leviter tunicatae, rima germinali hyalina metientes 6.7-8.9 µm longa, (8.9-) 11.0-13.3 x 6.7-8.9 (-10.0) µm. Holotypus: ILLS 51242. Etym.: L. ren, a kidney.

Coniochaeta renispora Crane & Shearer sp. nov. Figs. 1 - 8.

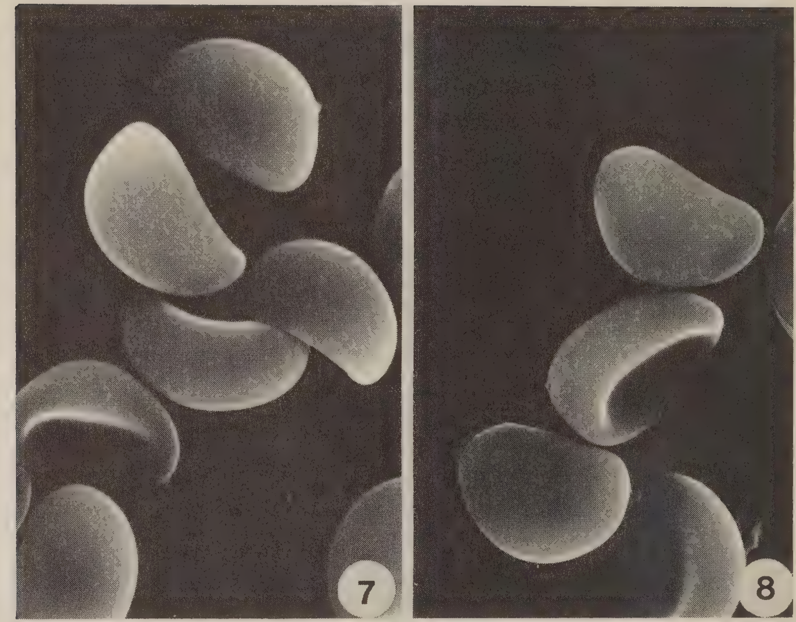
Ascomata immersed, globose, asetose, ostiolate, 428-530 x 420-594 µm diam. Beak papillate, 17-23 µm diam., wall composed of brown, thick-walled *textura prismatica*. Peridium glabrous, light brown, of thin-walled *textura angularis* in surface view, in longitudinal section with 6-10 cell layers, 18-20 µm thick. Peridial cells pseudoparenchymatous, irregularly shaped, radially compressed. Periphyses composed of oval to pyriform cells, constricted at septa, 15.5-20.0 (-27) x 2.2-3.3 µm. Paraphyses numerous, filamentous, multiseptate, simple, 94-100 (-104) x 2.0-2.2 µm. Asci cylindric to clavate, short-stalked, thin-walled, without an apical apparatus, deliquescent, 34-57 (-64) x 11.0-15.5 µm, containing eight, irregularly biseriate ascospores. Ascospores extruded and accumulating as shiny black mounds on s urface of substrate, one celled, inequilateral, reniform or one side convex, the other flat, occasionally lacrymoid to obpyriform, dark brown, smooth-walled, with a hyaline germ slit measuring 6.7-8.9 µm long, containing a single guttule, (8.9-) 11.0-13.3 x 6.7-8.9(-10.0) µm.
HOLOTYPE: USA, Arkansas, St. Francis River at Phillips Bayou, St. Francis National Forest, 14 November 1992, J. L. Crane and C.A. Shearer, A-102-1, ILLS 51242.

Coniochaeta ligniaria (Grev.) Massee as reported by Hawksworth and Yip (1981) and Cain (1934).sub. *C. discospora* (Awersw.) Cain and *C. emodensis* Udagawa and Horie (1982) are two species closely related to *C. renispora*. Both species differ from the latter in having narrower ascospores that are not consistantly reniform. They were isolated from soil and *C. emodensis* was also reported on dung. Five other species of *Coniochaeta* have been reported from freshwater habitats (Shearer, 1993); whether the *Coniochaeta* species found in fresh water are regular freshwater inhabitants or occur fortuitously by wash-in from terrestrial habitats is not yet known.

ACKNOWLEDGMENTS

Appreciation is expressed to Prof. D.P. Rogers for correcting the Latin description and to Prof. Jan Kohlmeyer for reviewing the manuscript. We are grateful to NSF (DEB 92-00885) for financial support of this study.

Figs. 1-6. *Coniochaeta renispora.* 1. Asci with mature and immature ascospores. X550. 2. Enlargement of peridium wall in longitudinal section. X366. 3. *Textura angularis* tissue of peridium wall in surface view. X523. 4. Mature ascus and ascospores. X533. 5. Paraphyses. X300. Ascoma in longitudinal section. X300.



Figs. 7-8. SEM of ascospores of Coniochaeta renispora. 7. X2,000. 8. X2,140.

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SOME NEW TAXA AND NEW RECORDS OF THE GENERA PLEOSPORA AND TEICHOSPORA FROM XINJIANG, CHINA

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SUMMARY

A new species of *Pleospora* with two varieties and four species of *Teichospora* occurring in Xinjiang, China are presented and illustrated. *Pleospora obtusispora* var. *obtusispora* and var. *triseptata* and *Teichospora lonicerae* are proposed as new. *Teichospora borealis*, *T. solitaria* and *T. winteriana* are recorded for the first time from China.

Species of *Pleospora* and *Teichospora* have been sparsely recognized in some provinces of China (Tai, 1979; Eriksson and Yue, 1988). During a survey of Pyrenomycetes in Xinjiang, some collections showing typical characteristics of the genera *Pleospora sensu lat.* and *Teichospora* were made within Xinjiang regions (province), mostly from desert areas. These species have not been reported previously in China and some of them have not been described either in China or elsewhere.

All of the holotype materials mentioned in the paper are deposited in the National Herbarium of Canada in Ottawa (DAOM) and the isotypes in the Herbarium of Mycology, August 1st Agricultural College (HMAAC), Urumqi, Xinjiang, China and in the New York Botanical Garden, Bronx (NY).

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[1] A Fund of Excellent Young University Teachers, The State Education Commission of China.

Two collections referrable to *Pleospora* are closely related to *P. richtophensis* Ellis & Everh. (Wehmeyer 1961), having collabent ascomata whose peridium cells, hyphae and hyphal appendages are thick walled and heavily encrusted with pigment. The asci of these collections tend to be longer and narrower, oblong rather than clavate as in *P. richtophensis*. The ascospores differ from those of *P. richtophensis* in more obtuse ends, into which the longitudinal septum may extend, and in relatively small sizes.

Pleospora obtusispora Z.Q. Yuan & M.E. Barr, sp. nov. var. ***obtusispora*** Fig. 1, d-g

Ascomata immersa ad erumpentia, discreta vel gregaria in catervatim, sphaeroidea, 280-400 µm lata, 250-300 µm alta, cum hypha tomentosa septata non ramosa fusca 35-40 x 6-7 µm tunicata; peridium 20-45 µm crassum, e cellulis rotundatis brunneis in stratis externis et hyalinis in stratis internis compositum. Asci 100-120 x 20-22 µm, octospori, oblongi. Ascosporae 18-26(-30) x 9-12(-14) µm, biseriatae, brunneae ad fuscae, ellipsoideae, extremo obtuso, 5 transversaliter et 1 longitudinaliter septatae, septo formato primo constrictae, e gelatina 3 µm lata cingulatae.

In ramis *Myricariae squamosae* Desv., Monte Tianshanico, Urumqi, Provincia Xinjiangensi, Sinica, 14 VIII 1992, Z.Q. Yuan 910411, DAOM holotypus. Isotypi in Herb. HMAAC 796 et NY depositi.

Ascomata immersed to erumpent, separate or gregarious in small groups, sphaeroid, 280-400 µm wide, 250-300 µm high, covered with dark brown, unbranched, septate tomentum, 35-40 x 6-7 µm; peridium 20-45 µm wide, of rounded brown cells in outer layers and hyaline cells in inner layers. Asci 100-120 x 20-22 µm, oblong, short stalked. Ascospores 18-26(-30) x 9-12(-14) µm (mean 21.8 x 11.1), biseriate, brown to dark brown, ellipsoid, ends obtuse, 5-septate, rarely 6- or 7- septate, constricted at the first-formed septum, with one longitudinal septum in each cell, rarely lacking longitudinal septa, surrounded by a gel coating, up to 3 µm wide.

Known from the type collection.

Pleospora obtusispora var. ***triseptata*** Z.Q. Yuan & M.E. Barr, var. nov. Fig. 1, a-c

Ascomata erumpentia ad superficialia, gregaria in catervatim vel ordinatim, sphaeroid, 160-240 µm lata, 120-240 µm alta; apice papillato, cum hypha tomentosa septata non ramosa fusca 30-35 x 6-8 µm tunicata; peridium 20-40 µm crassum, e cellulis angularibus ad rotundatis brunneis in stratis externis et hyalinis in stratis internis compositum. Asci 90-110 x 14-16 µm, tetraspori ad octospori, oblongi vel cylindrici. Ascosporae 22-28(-30) x 10-12(-15) µm, uniseriatae vel superimposite uniseriatae, fulvae ad viridifuscae, 3 transversaliter (raro 4 vel 5) et 1 longitudinaliter septatae, septo formato primo constrictae, e gelatina 4 µm lata cingulatae.

In ramulis decorticatis *Haloxyli ammodendri* (C.A. Mey.) Bunge, Beishawo, Changji, Provincia Zinjiangensi, Sinica, 1 V 1991, Z.Q. Yuan 910055, DAOM holotypus. Isotypi in Herb. HMAAC 795 et NY depositi.

Ascomata erumpent to superficial, gregarious in groups or in rows, sphaeroid, 160-240 µm wide, 120-240 µm high, apex papillate, covered with dark brown, unbranched, septate tomentum of stiff hyphae, 30-35 x 6-8 µm; peridium 20-40 µm wide, of angular to rounded brown cells in outer layers and hyaline cells in inner layers. Asci 90-110 x 14-16 µm, 4-8-spored, oblong to cylindrical, with short stalk. Ascospores 22-28(-30) x 10-12(-15) µm (mean 24.3 x 10.9), uniseriate or overlapping uniseriate, primarily yellow brown, greenish brown at maturity, 3-septate, occasionally 4- or 5-septate, with longitudinal septum in each of the central two cells, constricted at the first-formed septum, surrounded by a gel coating, up to 4 µm wide.

Known from the type collection.

Teichospora borealis (Ellis & Everh.) M.E. Barr, Mem. New York Bot. Gard. 62: 30. 1990. Fig. 1, h

Ascomata immersed to erumpent, gregarious, developing over old diaporthaceous stromata, globose, 240-500 µm diam; base with brownish hyphal subiculum; peridium 20-40 µm, brown. Asci 140-200 x 14-20 µm. Ascospores 22-25 x 12-14 µm, obliquely uniseriate, brown, broadly ellipsoid, ends obtuse, 7-9-septate (mostly 7), with 1-3 longitudinal septa, constricted at the first-formed septum; wall smooth.

Specimen examined: on branches of *Salix tianschanica* Rgl., Tianshan Mountain, Urumqi, Xinjiang, China, 10 V 1991, Z.Q. Yuan 910159, HMAAC 798, DAOM, and NY.

This collection is close to *T. winteriana* Berlese in hyperparasitic habit, but the ascospores are larger and form additional septa. It fits well with *T. borealis* in morphology and substrate.

Teichospora lonicerae Z.Q. Yuan & M.E. Barr, sp. nov. Fig. 1, j-l

Ascomata erumpentia ad superficialia, discreta vel gregaria in catervatim, sphaeroidea, 240-350 µm lata, 160-250 µm alta; apice papillato ad 100 µm alto, cum hypha abunda tunicata; peridium 20-40 µm crassum, e cellulis pseudoparenchymatis brunneis compositum. Asci 80-130 x 10-14 µm, octospori, cylindrici. Ascosporae (14-)22-24 x (6-)9-12 µm, uniseriatae, brunneae ad fuscae, fusoideae, extremo acuto, 3 vel 7 transversaliter et 1-2 longitudinaliter septatae; exosporio glabro.

In ramulis decorticatis *Lonicerae stenanthae* Pojark, Monte Tianshanico, Urunqi, Provincia Xinjiangensi, Sinica, 9 VII 1991, Z.Q. Yuan 910383, DAOM holotypus. Isotypi in Herb. HMAAC 799 et NY depositi.

Ascomata erumpent superficial, separate or gregarious in small groups, sphaeroid, 240-350 µm wide, 160-250 µm high, apex papillate up to 100 µm high, surface covered with abundant hyphae; peridium 20-40 µm wide, of brown pseudoparenchymatous cells. Asci 80-130 x 10-14 µm, 8-spored, cylindrical. Ascospores (14-)22-24 x (6-)9-12 µm (mean 22.7 x 10-6), uniseriate, brown to dark brown, fusoid, ends acute, 3-7-septate, with 1-2 longitudinal septa, some ascospores with 'Y'-type end cells; wall smooth.

Known from the type collection.

This new species is closely related to *T. minimispora* Barr, and agrees well in ascus and ascospore morphology. It differs from *T. minimispora* in the ascomata covered with abundant hyphae, ascospores wider (15-23 x 6-8 µm for *T. minimispora*, Barr, 1990), with 'Y'-type end cells and additional longitudinal septa in the mid cells.

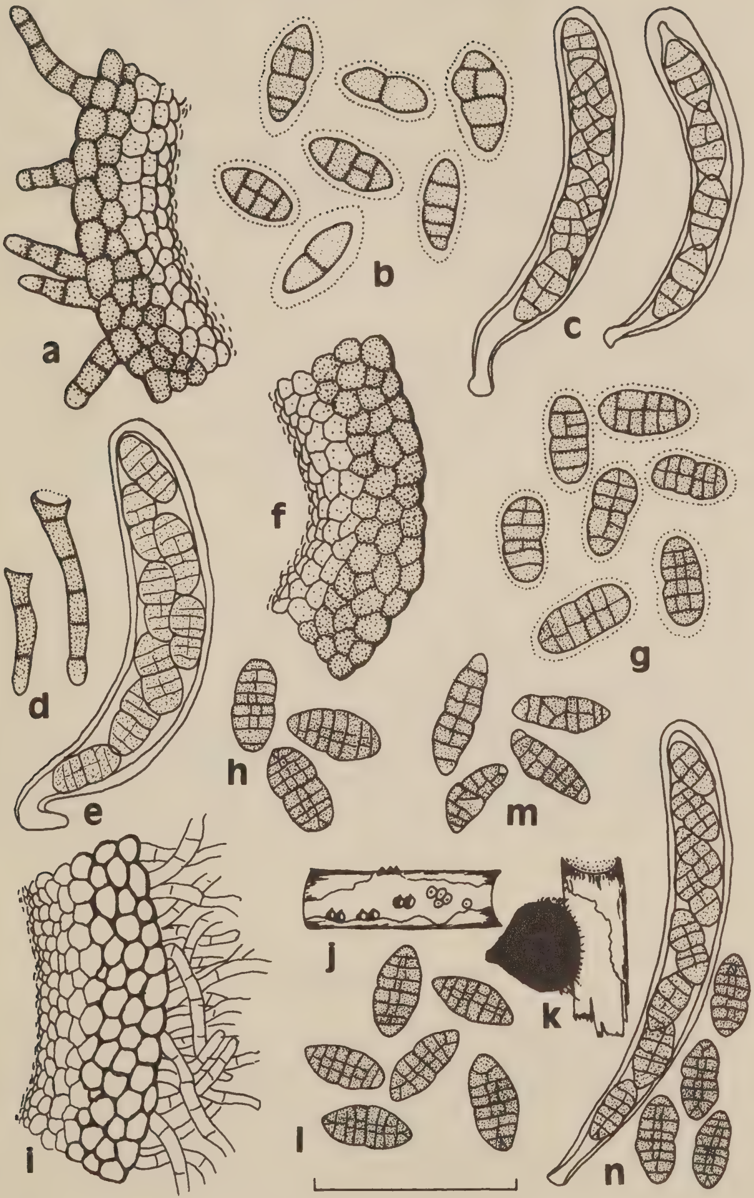
Teichospora solitaria (Ellis) Ellis & Everh. North Amer. Pyrenomyc. 214. 1891. Fig. 1, m

Ascomata immersed to erumpent, globose, 300-800 µm diam; peridium 25-50 µm wide. Asci 120-140 x 14-17 µm, cylindrical. Ascospores 20-34 x 8-10 µm, reddish brown, ends paler, 5-8-septate, with 1-2 longitudinal or oblique septa, constricted at the first-formed septum; wall smooth.

Specimen examined: on branches of *Nitraria sibirica* Pall., Beishawo, Changji, Xinjiang, China, 1 V 1991, Z.Q. Yuan 910023, HMAAC 823, DAOM, and NY.

The Chinese collection on *Nitraria* fits well with the concept of *T. solitaria*. This species is widespread in western North America on various woody plants and also known from eastern Asia (Barr, 1990). It is recorded here for the first time in China.

Fig. 1. a-c. Pleospora obtusispora var. *triseptata*: a. detail of peridium, b,c. ascospores and asci; d-g. *P. obtusispora* var. *obtusispora*: d. tomentum, e. ascus, f. detail of peridium, g. ascospores; h. *Teichospora borealis*: ascospores; i-l. *T. lonicerae*: i. detail of peridium, j,k. habit, l. ascospores; m. *T. solitaria*: ascospores; n. *T. winteriana*: ascus and ascospores. Standard line = 50 µm for all except for j and k. Habit sketches not to scale.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Teichospora winteriana Berlese, Icon. Fung. 2: 54. 1896. Fig. 1,n

Ascomata immersed to erumpent, gregarious, sphaeroid, 240-400 µm wide, 200-320 µm high; peridium 25-40 µm wide, reddish brown to dark brown. Asci 80-130 x 14-16 µm, 8-spored, cylindrical or clavate. Ascospores 16-24 x 8-10 µm, obliquely uniseriate or biseriate in upper parts of asci, yellowish brown to dark brown, ellipsoid, somewhat asymmetric, upper hemispore slightly wider, ends obtuse, (3-)5-7-septate, with 1-2 longitudinal septa, constricted at the first-formed septum; wall smooth.

Specimen examined: on twigs of *Hippophae rhamnoides* L., Tianshan Mountain, Urumqi, Xinjiang, China, 15 VIII 1991, Z.Q. Yuan 910406, HMAAC 797, DAOM, and NY.

This species has been recorded in Europe and North America (Barr, 1990). The present Chinese collection on *Hippophae* fits the concept of *T. winteriana* well in morphology except that it is not hyperparasitic. *Hippophae* is a new host plant of this fungus.

We thank Dr. S. Huhndorf for reviewing the manuscript.

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FURTHER INVESTIGATIONS ON *Gymnopilus* (AGARICALES, CORTINARIACEAE). A NEW SECTION AND A NEW SPECIES FROM MEXICO

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SUMMARY

As a contribution toward a monographic study of the genus *Gymnopilus* Karst., the new section *Macrospori* Guzmán-Dávalos in the subgenus *Gymnopilus*, based on the spore length [8-11(-12) μm] is proposed. In the same subgenus some species previously placed in the section *Microspori* Hesler, are now included in the section *Gymnopilus* also by the spore length. A new species in the section *Gymnopilus*, *G. subfulgens* Guzmán-Dávalos is described, differing in its basidiomata with reddish tinges, widely ellipsoid to subglobose spores and radial pileus trama.

RESUMEN

Como una contribución hacia un estudio monográfico del género *Gymnopilus* Karst., se propone la sección *Macrospori* Guzmán-Dávalos del subgénero *Gymnopilus*, caracterizada por sus esporas grandes [8-11(-12) μm de long.]. En el mismo subgénero algunas especies ubicadas previamente en la sección *Microspori* Hesler, se incluyen ahora en la sección *Gymnopilus* también de acuerdo al tamaño de sus esporas. Se describe una especie nueva, *G. subfulgens* Guzmán-Dávalos de la sección *Gymnopilus*, que se distingue por sus basidiomas con tonos rojizos, esporas ampliamente elipsoides a subglobosas y trama del píleo radial.

Gymnopilus Karst. is a large and complicated genus, in need of a monographic study. Hesler (1969) treated 73 species, principally of North America, however many tropical species remained unstudied. In this paper some aspects of the genus classification are reviewed and a new species is proposed. Basidiomata slides were mounted in 3 % KOH and in Melzer's reagent. The herbarium name abbreviations used here follow Holmgren **et al.** (1981).

GENUS CLASSIFICATION

Romagnesi (1942) was the first to divide the genus *Gymnopilus* in two infrageneric groups, *Annulati* Romagnesi and *Cortinati* Romagnesi, according to the veil. Singer (1949) considered the same divisions but as sections, the second one as *Sapinei* Fr. and finally as *Gymnopilus* (Singer, 1986). Hesler (1969) also accepted these divisions, but under the taxonomic rank of subgenus because he split subgenus *Gymnopilus* in two sections, *Microspori* and *Gymnopilus*, the first one with spores 3.5-7 μm long and the second with spores (6-)7-9 μm long.

Hesler included in Sect. *Microspori* species with 3.5-5.5 X 2.5-3.5 and 5.5-7(-7.5) X 3.5-4.5 μm spores, and in Sect. *Gymnopilus* species with spores 6-9(-10) μm long. According to the type examination of many species described by Hesler or species considered in his work (Hesler, 1969), it became difficult to separate species in that way, since a considerable number of species in two sections have spores 6-8 μm long. For example, the type of *G. obscurus* Hesler (Thiers 9677, SFSC) has spores 6.8-8 μm long, but Hesler described them as 5.5-7.5 μm long. In the type of *G. subtropicus* Hesler (Thiers 6345, SFSC) the spores are 6-7.6 μm long (5.5-7 μm according to Hesler) and in the type of *G. sordidostipes* Hesler (Smith 55808, MICH) the spores are 6-7.6(-8.5) μm long (*idem* as in Hesler). In the case of *G. pacificus* Hesler (Akamine 722, MICH, type) the difference is even greater because the spores measure 7-10 μm long, against 5.5-7(-7.5) μm described by Hesler.

Based on the above examples, it is recommended to include all of the species with spores 6-8 or 6-7.6 μm long in the section *Gymnopilus* to avoid confusion. The species revised here and excluded from section *Microspori* by their big spores, according to type examinations, are showed in table 1. On the other hand, in the section *Gymnopilus* there is a group of species with bigger spores, 8-11(-12) μm long, easy to distinguish from the rest and that could be segregated in a new section, which is proposed here. The species included in the new section *Macrospori* are indicated in table 2. In the case of *G. magnus* (Peck)Murr., Hesler (1969) described spores of 7.5-10 μm long, but after revision of the specimen Imshaug 3944 (MICH), determined as *G. magnus* by Hesler, it was found that the spores measure 8.5-12(-13) μm long.

The genus classification is as follows:

Gymnopilus subgenus ***Annulati*** Hesler, *North Amer. Sp. Gymnopilus,* 18, 1969.
[*Fulvidula* Romagn. (section ?) *Annulatae* Romagn., *Bull. Soc. Mycol. France 58:* 89, 1942, *nom. nud.*]
[*Gymnopilus* Karst. section *Annulati* Romagn., *in* Singer, *Lilloa 22:* 1949, *nom. nud.*]
Veil membranous or submembranous, if fibrillose forming a persistent annulus.
Type species: *G. spectabilis* (Fr.)A. H. Smith

Gymnopilus subgenus ***Gymnopilus***
Agaricus tribe *Flammulae* section *Sapinei* Fr., *Epicr. Myc.*, 188, 1838.
Gymnopilus Karst. section *Sapinei* (Fr.)Sing., *Lilloa 22:* 561, 1949.
[*Fulvidula* Romagn. (section ?) *Cortinatae* Romagn., *Bull. Soc. Mycol. France 58:* 89, 1942, *nom. nud.*]
Veil absent or fibrillose, fugacious, occasionally forming an evanescent annular zone.
Type species: *G. sapineus* (Fr.)Maire

Section ***Microspori*** Hesler, *North Amer. Sp. Gymnopilus,* 32, 1969.
Spores 3.5-6.5 µm long.
Type species: *G. bellulus* (Peck)Murr.

Section ***Gymnopilus***
Spores 6-9(-10) µm long.

Section ***Macrospori*** Guzmán-Dávalos, **sect. nov.**
Sporae 8-11(-12) µm longae.
Type species: *G. macrosporus* (Sing.)Sing.

Table 1. Species excluded from the section *Microspori* and transferred to the section *Gymnopilus*

	Spores length (μm)	
	Hesler (1969)	Type examination*
G. lepidotus Hesler	5.5-7(-7.5)	A. 6.4-7.6(-8)
G. obscurus Hesler	5.5-7.5	B. 6.8-8
G. pacificus Hesler	5.5-7(-7.5)	C. 7-10
G. parvisquamulosus Hesler	6-7.5	D. 7.2-8.8(-10.4)
G. sordidostipes Hesler	(5.5-)6-7.5	E. 6-7.6(-8.5)
G. subtropicus Hesler	(5-)5.5-7	F. 6-7.6
G. terrestris Hesler	(5-)5.5-7	G. 6-7.5

* Material revised: A. Campbell 21453, TENN; B. Thiers 9677, SFSC; C. Akamine 722, MICH; D. Thiers 11238, SFSC; E. Smith 55808, MICH; F. Thiers 6345, SFSC; G. Smith 40156, MICH.

Table 2. Species included in Section *Macrospori*

	Spore length (μm)*
Gymnopilus acystidiatus Guzmán-Dávalos & Guzmán	A. (7.2-)8-11.2(-12)
G. macrosporus (Sing.)Sing.	B. 8.5-10
G. magnus (Peck)Murr.**	C. 8.5-12(-13)
G. medius Guzmán-Dávalos	D. (7.6-)8-10.4(-11.2)
G. robustus Guzmán-Dávalos	E. 9.6-11.6

* Material revised: A. Guzmán-Dávalos 3361, IBUG (holotype); B. According to Horak (1989); C. Imshaug 3944, MICH; D. García-Franco, April 19, 1990, XAL (holotype) & Martínez, Sept. 15, 1978, MEXU-13709; E. Vargas 19, IBUG (holotype).
** Hesler (1969) reported spores 7.5-10 μm long.

A NEW SPECIES IN SECT. *GYMNOPILUS*

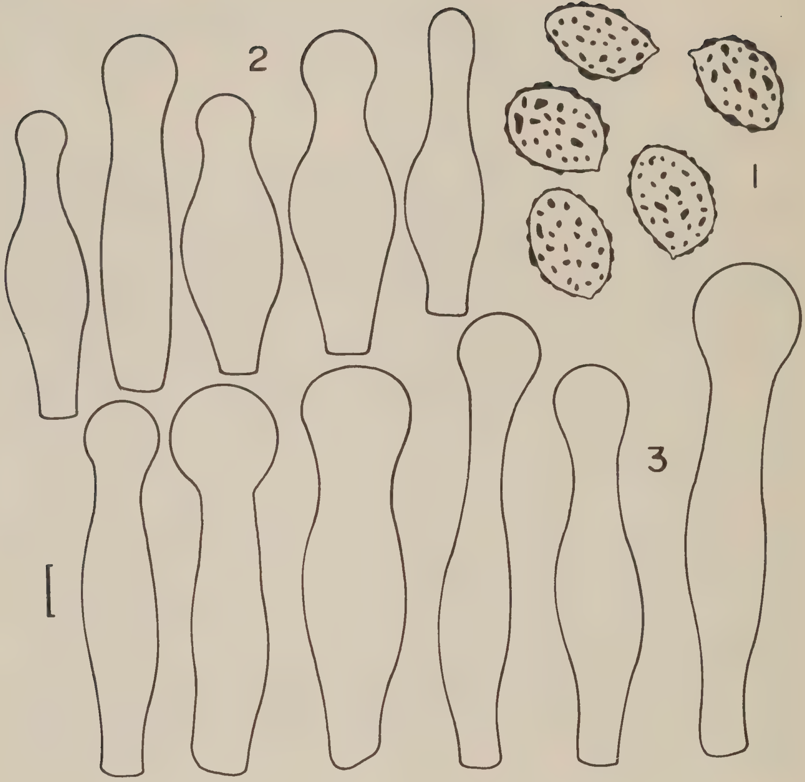
Gymnopilus subfulgens Guzmán-Dávalos, **sp. nov.**

Figs. 1-3

Pileus 20-45 mm diametro, convexo-campanulatus, glabrus vel fibrillosus, subinde centro squamuloso-appreso, aurantiaco-ferrugineus. Lamellae adnatae, confertae, angustae vel sublatae, aurantiaco-brunnae vel cinnamomea. Stipes 30-80 X 2-10 mm, centralis ad excentricus, fibrillosus, pileo concoloro. Contextum flavidum in statu sicco. Sporae 7.2-9.6(-10.4) X 5.6-7.2 μm, latae ellipsoideae vel subglobosae, verrucosae, plaga incospicua. Pleurocystidia 21.6-28 X 3.6-8(-10.8) μm, ampullacea, cylindrico-ventricosa vel cylindracea, capitata vel acephala. Cheilocystidia (26.4-)28.8-37.6 X 5.2-9.2 μm, cylindrico-ventricosa, cylindracea vel ampullacea, subcapitata vel capitata. Trama pilei radiata. Pileocystidia nulla. Caulocystidia 4.8-12 μm diametro, cylindracea. Fibuligerus. Ad truncos arborum prostratos Pini in pinetis vel Pini-Quercus sylvis, Durango, prope El Salto. Holotypus De la Campa y Guzmán NA-162 (INIF-84).

Pileus 20-45 mm diam., convex-campanulate, some specimens with a disk depression (at the stipe insertion) when dry, glabrous or fibrillose, sometimes the fibrils joined in groups and occasionally forming adpressed squamules at center, surface reddish orange-brown, margin incurved or straight-down, thin. Lamellae adnate, with or without a short decurrent tooth, close, narrow to sub-broad, orange-brown with mustard shades or cinnamon-brown. Stipe 30-80 X 2-10 mm, more or less uniform, central or eccentric, slightly fibrillose or fibrillose-striate, concolorous with the pileus, staining reddish black, hollow, filled with mustard-yellow hyphae. Veil not observed. Context more or less thin at the disk, yellow when dry. KOH stains pileus dark vinaceous red when dry.

Spores 7.2-9.6(-10.4) X 5.6-7.2 μm, widely ellipsoid, amygdaliform or subglobose, with subthick wall, strongly verrucose, without germ pore, with an inconspicuous plage, orangish-yellow-brown in KOH, yellowish-brown in Melzer's reagent. Basidia 27.2-36 X 5.2-6.8 μm, tetraspored, sterigmata 2.4-4 μm long., cylindric-clavate, with a thin or strong central constriction, hyaline or with yellowish or yellowish-brown content. Pleurocystidia 21.6-28 X 3.6-8(-10.8) μm, apex 3.6-6 μm diam., lageniform, cylindric-ventricose or cylindric, non-capitate or capitate, few ventricose-rostrate, hyaline or with yellowish content. Cheilocystidia (26.4-)28.8-37.6 X 5.2-9.2 μm, apex (4.4-)5.2-8.4 μm diam., cylindric-ventricose, cylindric or lageniform, subcapitate or capitate, with yellowish or yellowish-brown homogeneous or granulose content. Hymenophoral trama subparallel. Pileus trama radial, hyphae with thin to subthick wall, yellowish. Cuticle with hyphae 4-16 μm diam., prostrate, yellowish-orange or yellowish-brown, with encrusted walls. Pileocystidia absent. Caulocystidia 4.8-12 μm diam., cylindric, difficult to define due to lysis appearance, with yellowish, yellowish orange or yellowish brown content, present only in stipe apex, in tufts. Clamp connections present. With lactiferous hyphae. A yellow pigment is dissolved when mounted in KOH.



Figs. 1-3: *Gymnopilus subfulgens*, 1: spores, 2: pleurocystidia, 3: cheilocystidia (holotype)(scale = 4 μm).

HABITAT. Gregarious to cespitose on pine logs in *Pinus* or *Pinus-Quercus* forest.

MATERIAL STUDIED. DURANGO, El Salto region, km 1080 Durango to Mazatlán road, deviation to sawmill San Rafael, Arroyo Santo Domingo, alt. 2600 m, Sept. 19, 1961, **De la Campa y Guzmán NA-162** (holotype, INIF-84; isotype, IBUG). VERACRUZ, Hueyacocotla, Cerro Corcobado, alt. 2100 m, July 27-29, 1962, **Vela EA-303** (INIF-162, IBUG).

OBSERVATIONS. *G. subfulgens* is characterized by the size and color of the basidiomata, by the size and form of the spores and by the radial pileus trama. The spores in the revised materials changed to yellowish-brown in Melzer's reagent. This can be interpreted as dextrinoid reaction, because the author has observed that in some specimens of other species with typical dextrinoid spores, sometimes the spores discolor to yellowish-brown or yellowish in Melzer's reagent (Guzmán-Dávalos, 1993). Both studied specimens were originally identified as *Phaeocollybia festiva* (Fr.)Heim ex Sing. at INIF Herbarium. This species is closely related to *G. fulgens* (Favre & Maire)Sing., in macro and microscopic characteristics, but they are distinct because *G. fulgens* has distant lamellae and is mainly found in a terricolous habitat with mosses (Hesler, 1969). Moreno (1980) described *G. fulgens* var. *luteicystis* Moreno, differing from the typical variety by its' smaller spores (7-8.5 X 4-5 μm) and for having some yellow cystidia. The author of the present paper has observed that the last characteristic is very variable, since materials in the same species present hyaline cystidia, or with yellow, yellowish brown or orange-brown content. For this reason, it is not recommended to use the cystidia color as a diagnostic characteristic in *Gymnopilus*. Another related species to *G. subfulgens* is *G. mesosporus* Horak, which differs by the smaller basidioma, stipe always eccentric, spores with a well developed plage and perisporium, and by the absence of pleurocystidia (Horak, 1989).

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STECCHERINUM STRAMINELLUM COMB. NOV.

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Odontia straminella, a resupinate hydnoid species with fimbriate margin and skeletal hyphae was described by BRESADOLA in 1902, from material collected by Torrend in Portugal. The original description was not very detailed but taking into consideration all characters it was apparent that this species should be placed in the genus *Steccherinum*. In connection with preliminary studies on the *Corticiaceae* s.l. for the Flora Micológica Ibérica project, a specimen of *Odontia straminella* Bres., from the herbarium of Torrend deposited in COI, was examined.

It consists in a basidiome covering several scales of *Pinus*, effused, adnate, white to pale ochraceous, margin fimbriate, sometimes developing strands, easily separable from the substratum with aid of a scalpel; hymenophore odontioid to hydnoid, aculei up to 0.5 mm long, 0.1-0.2 mm broad, sometimes crowded, mostly scattered, subcylindrical to more or less flattened, simple or connate, slightly fimbriate at the tip; context thin, white.

Hyphal system dimitic, generative hyphae 2.5-4 µm wide, thin to slightly thick-walled, branched, septate with clamp-connections, skeletal hyphae 3-5 µm wide, thick-walled to solid, predominating in the whole basidiome (Fig. 1c-d). Pseudocystidia 7-15 µm wide, numerous, distributed along the aculei, sometimes protunding, thick-walled, becoming thin-walled in the obtuse apex, strongly encrusted in the upper part (Fig. 1e-f). Basidia 15-18 x 4.5-6 µm, subclavate, with clamped base and 4 sterigmata up to 3.5 µm long, spores 3.5-4.5 x 2-2.2 µm, ellipsoid to subcylindrical, thin-walled, non amyloid (Fig. 1a-b).

O. straminella is very close to *Steccherinum litschaueri*, differing only in the lenght of aculei that can reach 1 mm long in the latter species and in the filamentous margin; besides that *S. litschaueri* has thinner cystidia and spores subcylindrical to cylindrical, up to 5.5 µm long (ERIKSSON, HJORTSTAM & RYVARDEN, 1984).

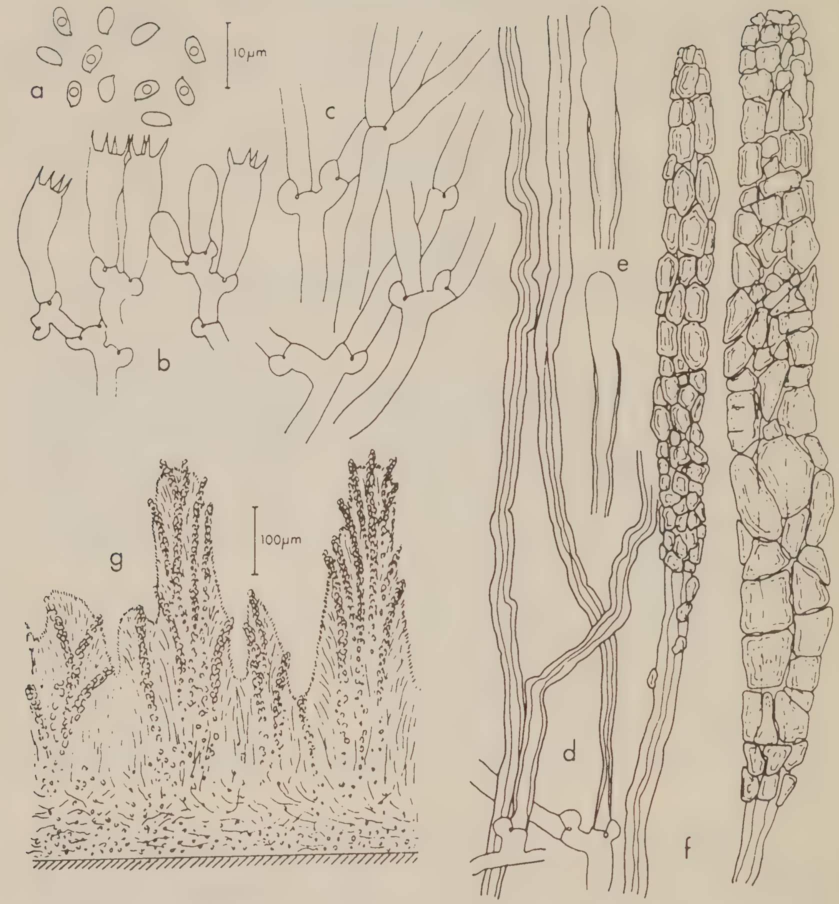

Fig. 1 - *Steccherinum straminellum*: a) spores, b) basidia, c) generative hyphae, d) skeletal hyphae, e) cystidial apices, f) cystidia, e) section through basidiome (C. Torrend, XII-1901).

The following combination is proposed:

Steccherinum straminellum (Bres.) Melo comb. nov.
Basionym: *Odontia straminella* Bres. *Atti Imp. Regia Accad. Rovereto, Ser. 3*, 8(2): 131, 1902.

Studied specimens:

ESTREMADURA (E): Lisboa, Parque Florestal de Monsanto, 29SMC8487, on fallen branches of *Pinus halepensis*, 12-III-1985, I. Melo, M.Correia & J. Cardoso 2734, LISU; ídem, I. Melo, M.Correia & J. Cardoso 2735, LISU; ídem, I. Melo, M.Correia & J. Cardoso 2736, LISU; ibídem, on fallen branches of *Pinus pinea*, 26-II-1986, I. Melo, M.Correia & J. Cardoso 3019, LISU. Setúbal, ad conos pineos, XII-1901, C. Torrend, COI.

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WESTERN AMERICAN PEZIZALES. STROBILOSCYPHA KELIAE GEN. AND SP. NOV. (PEZIZALES, SARCOSOMATACEAE) FROM OREGON

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Strobiloscypha keliae gen. et sp. nov. is described from Oregon, where it fruited on decaying pistillate cones of *Sequoiadendron giganteum* and *Chamaecyparis (Cupressus) lawsoniana.* Its affinities with the family Sarcosomataceae (Pezizales) are discussed.

Key Words: *Chamaecyparis, Cupressus*, new taxa, Pezizales, Sarcosomataceae, *Sequoiadendron, Strobiloscypha*, taxonomy

A small operculate discomycete fruiting on damp, decaying cones of *Chamaecyparis (Cupressus) lawsoniana* (A. Murr.) Parl. was discovered by Ms. Keli Kuykendall in Peavy Arboretum north of Corvallis, Oregon, in February 1991 (Fig. 1, A). Despite careful searches in the following weeks, no additional material of this species was located that year. However, in February 1992, Weber collected it again, this time on the cones of *Sequoiadendron giganteum* (Lindl.) Buchholz (Fig. 1, B). The two collections were made within less than 50 m of one another on old cones partly worked into the ground. No additional material was found in 1993 or 1994.

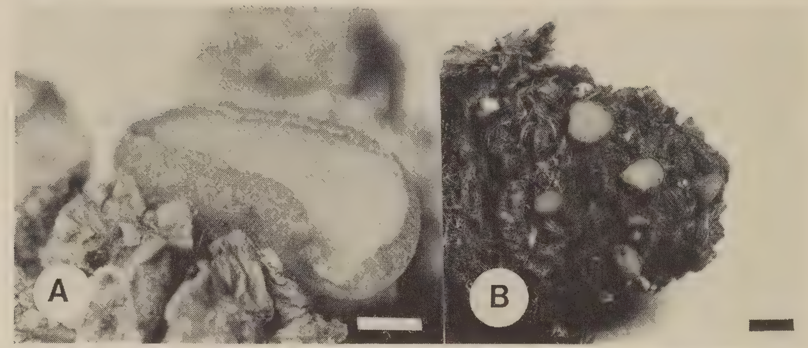

Figure 1. Ascomata of Strobiloscypha keliae. *A. On cones of* Chamaecyparis lawsoniana, *NSW 6387. Bar = 1 mm. B. On cone of* Sequoiadendron giganteum, *NSW 6713. Bar = 5 mm.*

MATERIALS AND METHODS

Materials and methods are those generally employed for the study of the Pezizales (Korf, 1973). Unless otherwise stated, descriptions and measurements of microscopic features were made on material mounted in water. The presence/absence of fungal gel was determined with toluidine blue-C (Moore, 1965). Color names enclosed in quotation marks were matched to Ridgway (1912). Specimens will be deposited at Oregon State University (OSC; Holmgren et al., 1990).

Strobiloscypha keliae N.S. Weber & Denison, gen. et sp. nov.

Apothecia sessilia, juventute aliquantum turbinata, maturitate vade crateriformia vel plana, 1.5-5.0(-7 .0) mm in diam, succulenta. Hymenium olivaceo-brunneolum vel olivaceo-cinereum. Pagina abhymenialis brunneola vel brunnea, glabra, margo minute pustullata. Sporae ellipsoideae, (18.7-)21-23.7 x (11.8-)12.5-13(-15.1) μm, hyalinae, maturitatae aguttulatae, verruculosae, in ascis uniseriate. Asci J-, operculati, 8-sporae, 316-368 x 14.3-18.4 μm. Paraphyses rectae, anguste clavatae, septatae. Subhymenium e excipulum medullosum texturis intricatis, hyphae 5.3-10.5(-15.6) μm in diam. Excipulum ectale texturis globulosis/angularis. In strobilis Cupressacearum e Taxodiacearum. Holotypus: N.S. Weber 6387 (HOLOTYPE, OSC).

ETYMOLOGY. Genus name: From Greek, "strobilo-" (cone) and "scypha" (cup) in reference to the substrate of the fungus. Specific epithet: Honors Keli Kuykendall who made the first collection.

Apothecia sessile, regular to compressed from above, 1.5-5.0(-7.0) mm in diam at maturity, in profile to 2 mm tall at maturity, somewhat turbinate when young, becoming shallowly bowl-shaped to nearly plane at maturity, fleshy but not gelatinous. Hymenial surface dull olive tan to olive gray (when moist, about "Isabella Color" to "Honey Yellow;" when dry, near "Old Gold"), plane to slightly concave, even. Margin entire, thick, fleshy, slightly raised, not distinctively ornamented. Abhymenial surface light to medium brown ("Cinnamon Brown" to "Mummy Brown"), ± glabrous except for a few small, appressed hyphal tips near the margin that form scattered minute pustules. Ascospores (Fig. 2, A, E, F) ellipsoid, (18.7-)21.0-23.7 x (11.8-)12.5-13.2(-15.1) µm, hyaline, with refractive-granular contents but no distinct large guttules at maturity; under oil immersion verruculose as viewed in cotton blue in lactic acid (NSW 6713), smooth at lower magnifications; obliquely to more often strictly uniseriate in asci; germinating readily. Asci J-, operculate; operculum round, apical to slightly eccentric; 8-spored; 316-368 x 14.5-18.4 µm; arising deep in the medullary excipulum; base slender, bearing 1 or 2 well-separated scars (Fig. 2, B), expanding and flexuous to the subcylindric sporogenous

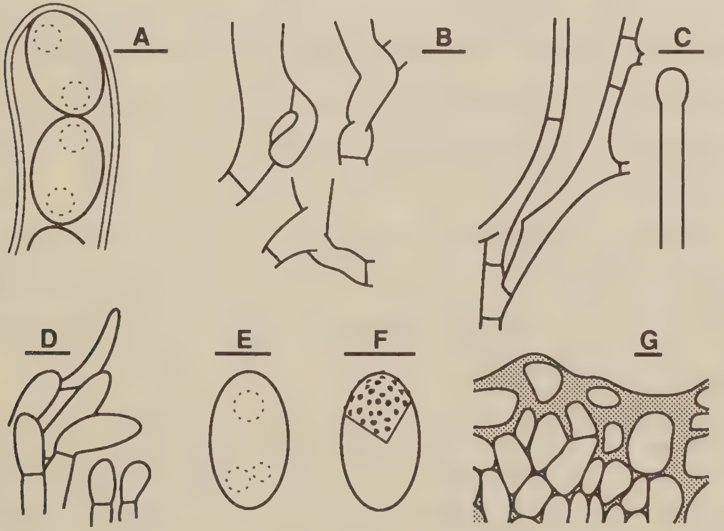

Figure 2. Microscopic features of Strobiloscypha keliae. *A. Ascus tip. B. Three ascus bases. C. Lower part of a paraphysis (left) and tip of a paraphysis. D. Vestiture near margin on abhymenial surface. E. Fresh ascospore in optical section as viewed in water. F. Ascospore in cotton-blue in lactic acid; note representative ornamentation. G. Section of ectal excipulum, stippled area indicates amorphous material. Bars = 10 µm.*

region; apex truncate-rounded; maturing sequentially; walls distinctly thicker than those of the paraphyses. Paraphyses (Fig. 2, C) straight; hyaline, ultimate cells typically with glassy-refractive contents as viewed in water; narrowly clavate, the clava 5.3-6.6(-7.8) µm in diam, below clava 2.6-3.9 µm in diam; septate; forking and anastomosing especially common in the lower half.

Subhymenium and medullary excipulum not well delimited from one another, not metachromatic in toluidine blue-C, of long-celled interwoven hyaline hyphae (*textura intricata*) with abundant interhyphal spaces; hyphae 5.3-10.5(-15.6) µm in diam, often slightly constricted at septa, branching, hyphal cells shorter and more irregular at the transition to the ectal excipulum. Ectal excipulum (Fig. 2, G) of short, versiform to globose cells varying to angular (*textura globulosa* to *t. angularis*); with irregular remnants of dark outer walls and amorphous deposits between the cells; walls of cells to interior of layer hyaline, toward and at the exterior golden brown or brown in water, greenish black in 2.5% KOH. Vestiture scanty, of short tufts (Fig. 2, D) of ascending hyphal tips on abhymenial surface, mixed with longer hyphal tips near margin. Walls of hyphae forming vestiture with irregular patches and zones of brown material as if a pigmented wall had been stretched apart. Margin meets or slightly exceeds hymenium, transition to hymenium gradual. Abundant thick-walled septate subcylindric hyphae present in the region of attachment.

HABIT, HABITAT, AND DISTRIBUTION. Single or cespitose, emerging between the cone scales of decaying, damp cones of *Chamaecyparis lawsoniana* or *Sequoiadendron giganteum*; Oregon; February.

MATERIAL EXAMINED. U.S.A. OREGON. Benton County: North of Corvallis in Peavy Arboretum, Sect. 30, T. 10 S., R. 5 W., on old cones of *Chamaecyparis lawsoniana*, 21 Feb. 1991, *Keli Kuykendall* (*NSW 6387*, HOLOTYPE; CUP 62477, ISOTYPE); same locality, on old partly buried cones of *Sequoiadendron giganteum*, 2 Feb. 1992, *N.S. Weber* (*NSW 6713*).

OBSERVATIONS. No evidence of a continuous gelatinous sheath was observed on freshly discharged ascospores; however, Weber observed a rounded balloon-like vesicle near the equator of some freshly discharged ascospores. Ascospores of NSW 6713 incubated overnight in drops of water germinated to produce twisted, septate germ tubes and hyphae, many with short side protrusions on the cells. The germlings survived for 3-4 days; no further efforts at culturing them were made.

In NSW 6713, many young apothecia were present (Fig. 1, B). The smallest were subglobose "Cinnamon" masses of tissue ca. 0.3 mm in diam. These masses apparently expanded into short columns ca. 1 mm tall and 0.5 mm in diam in which the apex became flat to slightly depressed and lighter (near "Honey Yellow") than the rest of the surface. The hymenium developed in this depression. Expansion continued in all directions to produce the mature apothecia. A few branched initials were observed, indicating that the ascomata have the potential of being cespitose.

Strobiloscypha shows definite affinities to the Sarcoscyphineae, including the thick-walled, slender, apparently aporhynchous, J- asci; much-branched, slender paraphyses; and ascospores that germinate readily. Like some members of the Sarcoscyphaceae, e.g., *Cookeina tricholoma* (Mont.) Kuntze (Pfister, 1978), the hymenium appears to be exposed during it early development. In the Sarcosomataceae *Chorioactis geaster* (Peck) Kupfer (Heald and Wolf, 1910; Seaver, 1942), *Urnula craterium* (Schwein. : Fr.) Fr. (Davidson, 1950), and *Neournula pouchetii* (Berthet and Riousset) Paden (N.S. Weber, personal observation), the developing hymenium is enclosed within a hollow ascoma until the asci are well developed. However, in *Sarcosoma mexicana* (Ellis and Holw. in Holw.) Paden and Tylutki, the hymenium is exposed, often for several weeks, before asci are evident and long before the ascospores mature (Judy Roger and N.S. Weber, personal observations).

The asci arising deep in the subhymenium/medullary excipulum, the dull coloration of the ascomata, and the hibernal fruiting pattern are all features of the Sarcosomataceae. The combination of brown tones on the abhymenial surface, dingy yellowish to olive yellow hymenial surface, small fruiting bodies, substrate preference, and lack of gelatinization appears to be unique in the family. The presence of cyanophilic markings, although very small, on the ascospores indicates a possible placement in tribe Galielleae. Cyanophilic ornamentation on the ascospores is the primary character used to differentiate the tribe Galielleae from tribe Sarcosomateae in the family Sarcosomataceae (Korf, 1970) and indeed from all other members of the suborder Sarcoscyphineae.

Korf (1973) included *Nannfeldtiella* Eckblad, *Galiella* Nannf. and Korf in Korf, *Wolfina* Seaver ex Eckblad, and *Neournula* Paden and Tylutki in tribe Galielleae. *Nannfeldtiella* now is considered to belong in another family (i.e., Helvellaceae, Eckblad, 1968, and Eriksson and Hawksworth, 1988, or Pyronemataceae as a synonym of *Pseudombrophila* Boud., Harmaja, 1979); *Wolfina* has ascospores ornamented with longitudinal ridges and corky ascomata; *Neournula* has distinctly warted ascospores and urnulate, almost leathery, apothecia that are terrestrial. *Galiella* shows the greatest similarity to *Strobiloscypha* but differs in having a well-developed gelatinous medullary excipulum and well-developed vestiture on the abhymenial surface as well as being lignicolous. *Strobiloscypha* presents a distinctive combination of characters.

Examination of the ascospores with a scanning electron microscope, and determination of the number of nuclei per ascospore and per cell in the paraphyses, are planned when additional material is located. These studies may help clarify the relationship of *Strobiloscypha* to other members of the Sarcosomataceae.

ACKNOWLEDGEMENTS

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THE LICHEN GENUS NEOHEPPIA

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Abstract: The lichen genus *Neoheppia* is resurrected as a genus in the family Peltulaceae. Besides the type species of the genus, *N. brasiliensis* Zahlbr., the new species *N. cataractae* Büdel & Sérusiaux from Zaïre is included into the genus. The ecology of the new species is discussed and a key is included.

Introduction

The cyanobacterial lichen family Peltulaceae was separated from the Heppiaceae on the basis of ascocarp development, ascus structure and function and thallus anatomy (Büdel 1987a). In the past the genus *Peltula*, introduced in 1853 by Nylander for the desert soil living species *Peltula radicata* Nyl., was included into the genus *Heppia* or subdivided into a number of different taxa (Table 1).

In 1909, Zahlbruckner introduced the new genus *Neoheppia* with the type species *N. brasiliensis* Zahlbr., and placed it in the family Heppiaceae. According to Zahlbruckner (1909), the new genus was separated from *Heppia* by its truly crustose thallus, attached to the substrate by all parts of the lower surface. Later on, Gyelnik (1935) excluded the genus *Neoheppia* from the Heppiaceae and transferred it to the Pyrenopsidaceae (= Lichinaceae according to Henssen 1963). Since then, the status of the genus *Neoheppia* was not revised, nor included in any other taxonomic treatment.

During a phytosociological survey of the vegetation along the Tshopo river near Kisangani, Zaïre, Léonard (1993) found a crustose lichen growing on rock in the Tshopo river, periodically submerged during the rainy season. It was sent to E. Sérusiaux (Liège, Belgium) and subsequently to me for identification. It was found to be a new species of the genus *Neoheppia*. As a result, a revision of the genus is presented here.

Table 1

Naegeli* 1853	Nylander 1853	Vainio 1890 Zahlbr. 1906	Zahlbruckner 1908, 1922–40	Gyelnik 1935	Wetmore 1971	Swinscow & Krog 1979
Heppia		*Heppia*	*Heppia*	*Heppia*	*Heppia*	*Heppia*
		Sct. *Heterina*	Sct. *Heterina*	=Ephebaceae	=*Peltula* p.p.	*Peltula*
		Sct. *Solorinaria*	Sct. *Solorinaria*	*Solorinaria*	=*Peltula* p.p.	*Peltula*
		Sct. *Pannariella*	Sct. *Pannariella*	*Pannariella*	=*Peltula*	not included
	Peltula	Sct. *Peltula*	Sct. *Peltula*	*Peltula*	*Peltula*	Peltula
			Sct. *Placoheppia*	=*Solorinaria*	=*Peltula*	not included
			Amphidium (*Latzelia*)	=*Epiphloea*	not included	not included
			Neoheppia	=Pyrenopsidaceae	not included	not included
			Pseudoheppia	=*Porocyphus*	not included	not included
				Nylanderopsis	not included	not included
				Gloeoheppia (Pyrenopsid.)	not included	=*Heppia*

* Naegeli in Hepp, 1853

Materials and Methods

The following type material has been used for the present study (abbreviations of the herbaria according to the Index Herbariorum):

Neoheppia brasiliensis Zahlbr.: Brasil, São Paulo, Salto Grande do Rio Paranapanema, ad saxa, 500 m. Leg.: V. Schiffner, no. 20702, VII. 1901 (isotype, Herbarium Darwinion, Buenos Aires, Argentina; holotype W, not seen).

Peltula impressa (Vain.) Swinscow & Krog: Africa centr., Ruwenzori exped.: in rupe gneissacea 1300 ped. s.m. in viciniis Ruwenzori, Scott Elliot 14, 1893–94 (holotype, TUR-Vain 12492).

Peltula placodizans (Zahlbr.) Wetmore: U.S.A., Arizona, Tucson, Tumamoc Hill, Station II, south exposed slope on rocks, 2600 ft., Blumer, 1908 (holotype, W).

Peltula tenuis Büdel et Henssen: Lesotho, Div. Maseru, Marakabei, Sengunyane, Mme. L. Kofler 310104c, 10. Oct. 1963 (holotype, LD).

The internal morphology of the lichen thalli was studied in sections prepared with a freezing microtome. Sections were mounted in lactophenol cotton-blue (Merck 13741). Micrographs were taken on Technical Pan 2415 black and white film (Kodak) with a Zeiss Axiophot microscope and macrographs with a Nikon F3 camera with bellows and a Zeiss Luminar 40 mm lens.

Results and Discussion

The genus *Neoheppia* Zahlbr. is mainly characterized by its truly crustose-rimose thallus (figs. 1–2, 4–6), attached to the substrate by the entire lower surface (Zahlbruckner 1909). This attachment base is build up of anticlinally arranged hyphae (fig. 7). The lichen has a pseudoparenchymatous or prosoplectenchymatous, nongelatinous internal structure and the ascus of the genus is polysporous, unitunicate-rostrate with a lacerate sheath surrounding it (figs. 9 + 12). Ascomata and conidiomata are identical with those of the genus *Peltula* (Büdel 1987a+b). All characters stated here support the placement of *Neoheppia* as a good genus into the family Peltulaceae. Thus, Gyelnik´s (1935) transfer of the genus to the Pyrenopsidaceae can not be followed here.

Species of the genus *Peltula* are attached to the substrate either by rhizines (on rock or soil), tufts of rhizoidal hyphae (on soil) or an umbilicus (on rock). They all share as a common feature a constriction of the single squamule at the base, or, as in many soil inhabiting species, a more or less central origin of rhizines and rhizoidal tufts. Even in crustose-effigurate species like *Peltula placodizans*, *P. tenuis* (fig. 3) or *P. impressa*, the single, minute squamules are attached by a central umbilicus at the lower surface (comp. Büdel 1987a, figs. 155, 183, 186 + 200).

The genera *Placoheppia* and *Solorinaria* were separated from *Peltula* by the mode of substrate fixation (Gyelnik 1935). Because the mode of attachment varies with the substrate the species lived on, Wetmore (1971) and later on Swinscow and Krog (1979) could not accept this as a usefull taxonomic criterion. In the genus *Neoheppia*, the mode of attachment is always correlated with the crustose-rimose morphology of the thallus, and thus, is a stable character.

The genera *Neoheppia* and *Peltula* can easily be distinguished in the side view or in cross sections: while the thallus or single squamules of *Peltula* always has the basal constriction, even in the smallest crustose species, the attachment in *Neoheppia* is always performed by the entire lower surface. As a result, species of *Peltula* remind the shape of mushrooms, wheras species of the genus *Neoheppia* are true flat crusts. The thallus of the genus *Neoheppia* becomes secondarily areolated (= rimose) by cracks, developing in larger areoles or young thallus parts (figs. 1-6).

The thallus construction as a flat crust, tightly attached to the rock surface in the two species resembles that of *Pterygiopsis submersa* Büdel, Henssen & Wessels and *Porocyphus effiguratus* Henssen, both species of the lichen family Lichinaceae that also occur in running water along waterfalls (Henssen et al. 1985). The flat, adnate and superficially smooth thalli with a tight, prosoplectenchymatous internal morphology, thus might be interpreted as an adaptation to the habitat on rocks in rapids or waterfalls of rivers.

Key to the species

1a. Thallus crustose-squamulose, thalli or squamules constricted at the base.................................*Peltula*

1b. Thallus crustose-rimose, not constricted at the base, attached to the substrate with the entire lower surface..*Neoheppia* 2.

2a. Apothecia with open, reddish to blackish-brown discs, up to 0.4 mm in diameter, angular; areoles 0.8-1.8 mm large, rim of areoles not black...*N. brasiliensis*

2b. Apothecial opening punctiform, circular, up to 0.1 mm in diameter, black; areoles 1.5-3.5 mm large, cracks and rim of areoles with black margins..*N. cataractae*

The species

Neoheppia brasiliensis Zahlbr.; Zahlbruckner, A., 1909. Denkschr. d. mathem.-naturw. Kl. Bd. 83: 144. Brasil, São Paulo: Salto Grande do Rio Paranapanema, ad saxa, 500 m. Leg.: V. Schiffner, VII. 1901

Because of the rare reports of this species in the literature, a short description is given here: thallus crustose-rimose, rarely effigurate at margins, brownish-olive, areolae more or less polygonous (fig. 1), 0.8-1.8 mm large. Apothecia immersed, 1-5 per areole, disc 0.1-0.4 mm wide, irregular in shape (fig. 2) and reddish-brown to blackish-brown in color. Ascus unitunicate-rostrate with a lacerate sheath, polysporous (fig. 12); Spores bacilliform, colorless, 1.8-2.5 x 3.5-5 µm.

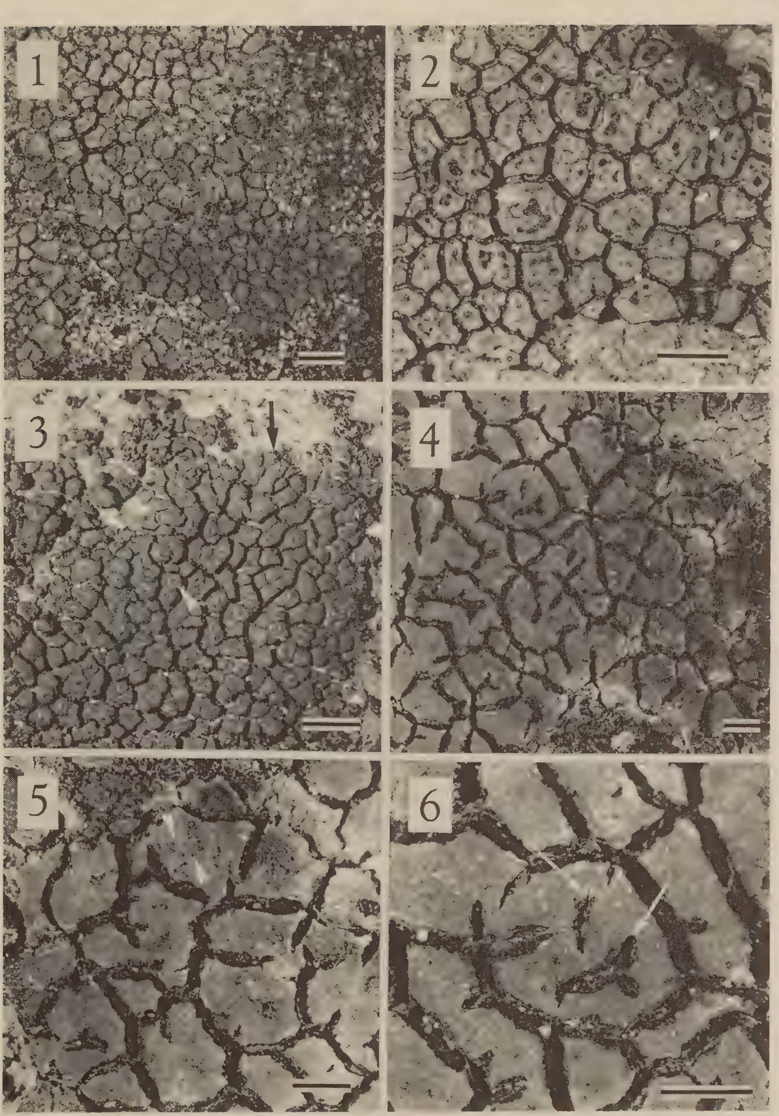
Known distribution: - Brasil (type locality); - Souh Africa, Transvaal, Tzaneen, Great Letaba River, 23°57´S, 30°01´E. Leg.: B. Büdel & D. Wessels, no. 14083a, 16.X.1983, herb. Büdel.

Neoheppia cataractae Büdel et Sérusiaux spec. nov.

Diagnosis: Thallus epilithicus, crustoso-rimosus, usque ad 150 mm altus. Areolae 1.5-3.5 mm latae, 0.35 mm altae, olivaceo-brunneae. Alga ad ordinem Chroococcales pertinens. Thallus homoiomericus, prosoplectenchymaticus.

Apothecia immersa, disci punctiformi, 0.04-0.1 mm in diam., fuscobrunnei. Excipulum proprium abest. Epihymenium atrobrunneum, 10 µm altum, hymenium 90-120 µm altum, subhymenium 30-40 µm altum. Paraphyses simplices, 1.4-1.8 µm crassae. Asci obclavati, 15-38 x 74-118 µm, unitunicati, polyspori. Ascosporae ellipsoideae, non septatae, hyalinae, 2.3-4.7 x 4.7-9.3 µm.

Pycnidia immersa. Conidia fusiformia, 3-3.5 x 1-1.5 µm.



Figs. 1 + 2. *Neoheppia brasiliensis*, isotype. **1.** Thallus margin. **2.** Areoles with apothecia (arrowhead). **Fig. 3.** *Peltula tenuis*, thallus with effigurate margin (arrow) and apothecia with punctiform disc (arrowhead). **Figs. 4–6.** *Neoheppia cataractae*, holotype. **4.** Thallus margin. **5.** thallus areole with numerous apothecia with punctiform discs (arrowheads). **6.** Areole with secondary cracks (arrows). **Scale bar** equals 1 mm in all figures.

Holotypus: Zaïre, Tshopo waterfalls, near Kisangani, on exundated rocks during the low water-level period, frequently mixed with the cyanobacterium/ blue-green alga *Pleurocapsa minor* Hansg. emend Geitler. J. Léonard, July 1947, no. 1329, Herbarium Horti Botanici Nationalis, Belgium (BR).

Morphology: Thallus crustose-rimose(fig. 4), up to 150 mm large, secondarily areolated, areoles 1.5-3.5 mm large, 0.35 mm thick; olive but black along cracks where secondary division into areoles starts and also at the edges of the resulting areoles (fig. 6). Attached to substrate with the entire lower surface. Photobiont a cyanobacterium/blue-green alga, probably unicellular and a member of the order Chroococcales.

Ascoma true apothecia, immersed (fig. 5), 1-20 (sometimes more) per areole, disc punctiform, 0,04-0.1 mm in diameter, black; epithecium vividly red with KOH (best visible in handsections of the upper hymenial part!).

Anatomy: Thallus homoiomerous, in sections 330-350 µm thick, upper cortex not developed; with a thin epinecral layer, 3-10 µm thick and yellowish pigmented (fig. 7). Medulla prosoplectenchymatous, with photobiont cells arranged in vertical rows (fig. 8 + 10), distributed over the whole depth of the thallus (fig. 7), photobiont cells angular, 1.8-5.3 µm in diameter (fig. 10); medullary hyphae anticlinally arranged, conglutinated, forming a prosoplectenchyma, cells quadratic to slightly rectangular, 2-4.5 µm thick (fig. 10). Thallus at the margins of areoles pseudoparenchymatous, with the outermost cell walls pigmented deeply blackish-brown (fig. 8). Lower cortex not developed; thallus tightly attached to the substrate by the entire lower surface with anticlinally arranged hyphae (fig. 11).

Apothecia immersed in the thallus, in sections 100-190 µm wide and 110-180 µm high (fig. 7); without a true excipulum proprium; epihymenium blackish-brown, c. 10 µm thick, hymenium 90-120 µm high, subhymenium 30-40 µm (fig. 9). Asci obclavate 15-38 µm wide and 74-118 µm long, unitunicate-rostrate with striated sheath surroundig the upper part, typically for Peltulaceae (fig. 9); asci polysporous, spore number between 60 and 100 (sometimes even more); spores ellipsoid, 2.3-4.7 x 4.7-9.3 µm, colorless, unicellu-

Abb. 7-11: Anatomy of *Neoheppia cataractae*. **7.** Longitudinal section showing immersed apothecium, pycnidium and attachment base. **8.** Margin of an areole with black pigmented hyphae and photobiont cells in anticlinally arranged rows (arrow). **9.** Apothecium, polysporous asci with lacerate sheaths. **10.** Pycnidium; arrow indicates photobiont cells. **11.** Section through a fertile areole, also showing the attachment base. **12.** Polysporous, unitunicate-rostrate ascus of *Neoheppia brasiliensis* (isotype) with lacerate sheath (arrows). **Scale bars** represent 50 µm in figs. 1 + 11 and 20 µm in figs. 8-10 + 12.

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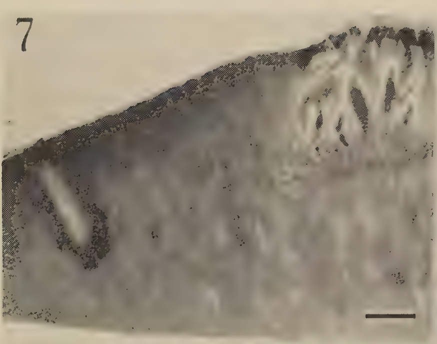

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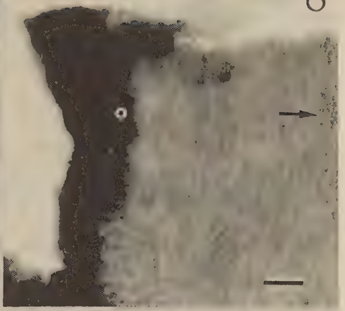

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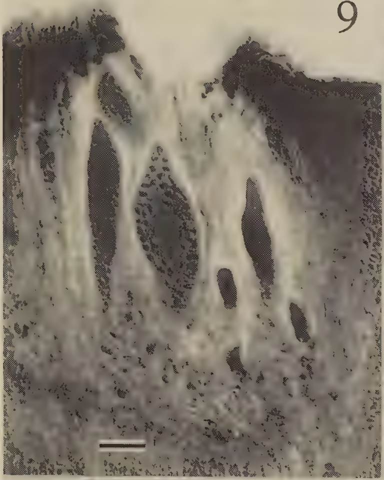

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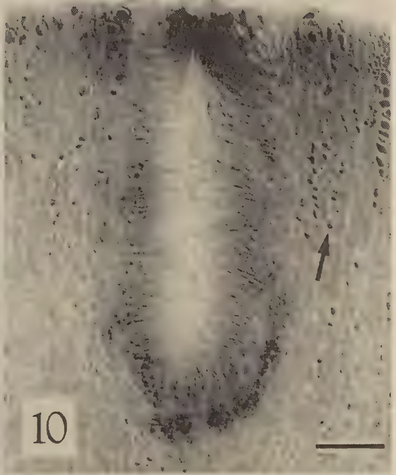

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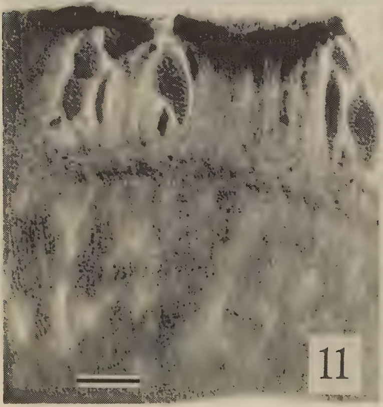

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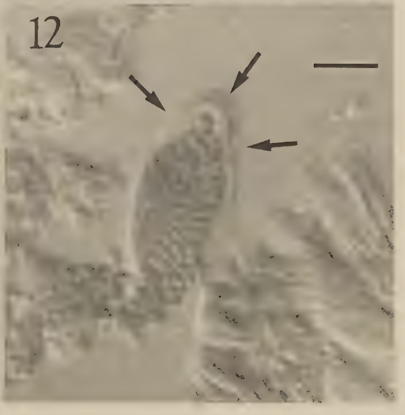

lar. True paraphyses simple, only rarely anastomosing, 1.4–1.8 µm thick, cells rectangular, intensively staining with cotton blue.

Conidiomata uni- to plurilocular, immersed pycnidia, cylindrical in sections. Conidia terminaly formed, fusiform, 3–3.5 µm long and 1–1.5 µm thick (fig. 10).

Epihymenium blue with IKI; hymenium negative with IKI before and after KOH treatment. Asci walls blue with IKI before and after KOH treatment.

Ecology: *Neoheppia cataractae* has been rarely observed (in 2 phytosociological relevés out of 8) in the *Leiothylax quangensis* (Engl.) Warm. and *Ledermanniella congolana* (Hauman) C. Cusset association (Podostamaceae) in which it was forming a crustaceous stratum (Léonard 1993). This association was growing in the rapids and in the waterfalls on rocks frequently and violently beaten by water, but generally not submerged during the low water period.

The new species has mostly been observed (in 5 relevés out of 6, but with low cover values) in the *Eragrostis barteri* Hubb. (Graminea) and *Dyschoriste perrottetii* (Nees) O. Ktze. (Acanthaceae) association (Léonard 1993). In this vegetation, the new species was forming a crustaceous stratum covering 5–20% of the surface with 4 other species of lichens, including *Peltula euploca* (Ach.) Poelt ex Pišút and *Peltula tortuosa* (Nees) Wetmore (plus *Lecanora* sp. and a sterile crust). The *Eragrostis–Dyschoriste*–vegetation has been found in the cracks of rocks either periodically flooded by a rapid of the Tshopo river and not submerged during the low water-level period, or periodically flooded during the high water-level period of the neighbouring Zaïre river and under light sprays during the low water-level period.

Amongst the various types of vegetation existing from the centre of the Tshopo waterfalls towards the banks, the optimum of development of *N. cataractae* seems to be situated in the *Eragrostis–Dyschoriste* association (see the synthetical association table in Léonard 1993: 336).

Remarks: The new species is distinguished from *N. brasiliensis* by its non effigurate, olive-colored thallus with black margins along cracks and areoles, the apothecia with punctiform discs and the remarkably larger spores. *N. cataractae* is only known from the type locality.

Acknowledgements

I would like to express my sincere thanks to Prof. J. Léonard (Meise, Belgium), who made the lichen material available and supported me with the ecological data. Thanks are also due to E. Sérusiaux (Liége, Belgium) for sending the specimens to me. H.T. Lumbsch (Essen, Germany) is thanked for the latin diagnosis. The work was supported by the DFG with grants Bu 666/4-1 and 5-1.

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NOMENCLATURAL NOTES ON AUSTRALIAN MACROFUNGI

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ABSTRACT

Sixteen new combinations and one new name for species of macrofungi recorded from Australia are proposed in the genera *Austroboletus*, *Campanella*, *Crepidotus*, *Dermocybe*, *Entoloma*, *Hygrocybe*, *Neolentinus*, *Omphalina*, *Panus* and *Ramicola*.

INTRODUCTION

The first volume of a *Catalogue of Literature Records of Australian Macrofungi*, dealing with agarics and related groups, is in preparation. Where generic concepts accepted in that work differ from those of authors who have recorded fungi from Australia, some new combinations are required. These are proposed below, along with some other necessary name changes.

NEW COMBINATIONS AND NEW NAMES

(1) **Various genera.**

Following Singer (1986) we recognise *Dermocybe* (Fr.) Wünsche as separate to *Cortinarius* (Pers.) Gray, do not segregate lichenised species of *Omphalina* Quél. in *Phytoconis* Bory, and place *Acurtis* Fr. under *Entoloma* (Fr.) P.Kumm., *Gliophorus* Herink under *Hygrocybe* (Fr.) P.Kumm., and *Phialocybe* P.Karst. under *Crepidotus* (Fr.) Staude, hence the following transfers.

Crepidotus improvisus (E.Horak) *comb. nov.*

BASIONYM: *Phialocybe improvisa* E.Horak, *Austral. J. Bot.*, *Suppl. Ser.* **10**: 33 (1983).

Dermocybe alkalivirens (Høil. & Watling) *comb. nov.*

BASIONYM: *Cortinarius alkalivirens* Høil. & Watling, *Pl. Syst. Evol.* **171**: 138 (1990).

Dermocybe chromobasis (Høil. & Watling) *comb. nov.*
  BASIONYM: *Cortinarius chromobasis* Høil. & Watling, *Pl. Syst. Evol.* **171**: 138 (1990).

Entoloma sericeum (Bull.) Quél. var. ***antarcticum*** (Singer) *comb. nov.*
  BASIONYM: *Acurtis sericea* (Bull.) Singer subsp. *antarctica* Singer, *Mycologia* **51**: 587 (1959).
  Rhodophyllus sericeus (Bull) Quél. subsp. *antarcticus* (Singer) Singer, in Bunt, *ANARE Sci. Rep., ser. B (II) Bot.* **78**: 9 (1965).
  R. sericeus (Bull) Quél. var. *antarcticus* (Singer) Singer, *Beih. Nova Hedwigia* **29**: 339 (1969).
  E. sericeum (Bull.) Quél. subsp. antarcticum (Singer) E.Horak, in Laursen & Ammirati, *Arctic and Alpine Mycology* 87 (1982) [combination invalid, basionym not cited].

Hygrocybe chromolimonia (G.Stev.) *comb. nov.*
  BASIONYM: *Hygrophorus chromolimonius* G.Stev., *Kew Bull.* **16**: 283 (1962).
  Gliophorus chromolimonius (G.Stev.) E.Horak, *Beih. Nova Hedwigia* **43**: 167 (1973).

Hygrocybe gramminicolor (E.Horak) *comb. nov.*
  BASIONYM *Gliophorus gramminicolor* E.Horak, *Beih. Nova Hedwigia* **43**: 176 (1973).

Hygrocybe stevensoniae nom. nov.
  REPLACED SYNONYM: *Hygrophorus viridis* G.Stev., *Kew Bull.* **16**: 383 (1962) non *Hygrocybe viridis* Capelari & Maziero (1988).
  Gliophorus viridis (G.Stev.) E.Horak, *New Zealand J. Bot.* **9**: 462 (1971).

Omphalina chromacea (Cleland) *comb. nov.* [this combination has already been used by Young (1982: p. 101) and others, but without citation of the basionym].
  BASIONYM: *Omphalia chromacea* Cleland, *Trans. & Proc. Roy. Soc. South Australia* **48**: 239 (1924).
  Botrydina chromacea (Cleland) Redhead & Kuyper, in Laursen et al., *Arctic and Alpine Mycology* **2**: 333 (1987) [basionym incorrectly cited as *Toad. Mush. S. Australia* **1**: 86 (1934), but combination valid under Art. 33.2].
  Phytoconis chromacea (Cleland) Redhead & Kuyper, *Mycotaxon* **31**: 222 (1988) [basionym incorrectly cited, as for *B. chromacea*].

(2) ***Lentinus***.

In comparison to the treatment of *Lentinus* Fr. by Pegler (1983), we prefer to recognise the subgenus *Panus* (Fr.) Pegler at generic rank. Following Redhead & Ginns (1985), we also accept the separation of some species of *Panus* Fr. in the genus *Neolentinus* Redhead & Ginns. This arrangement is supported by the molecular evidence provided by Hibbett & Vilgalys (1993).

Panus ciliatus (Lév.) *comb. nov.*
  BASIONYM: *Lentinus ciliatus* Lév., *Ann. Sci. Nat., Bot.*, sér. 3, **2**: 175 (1844).

Panus hookerianus (Berk.) *comb. nov.*
  BASIONYM: *Lentinus hookerianus* Berk., *Hooker's J. Bot. Kew Gard. Misc.* **3**: 44 (1851).

Panus punctaticeps (Berk. & Broome) *comb. nov.*
  BASIONYM: *Lentinus punctaticeps* Berk. & Broome, *Trans. Linn. Soc. London, Bot.*, ser. 2, **2**: 55 (1882).

Panus similis (Berk. & Broome) *comb. nov.*
  BASIONYM: *Lentinus similis* Berk. & Broome, *J. Linn. Soc., Bot.* **14**: 43 (1873).

Panus tephroleucus (Mont.) *comb. nov.*
  BASIONYM: *Lentinus tephroleucus* Mont., *Tijdschr. Wis.-Naturk. Wetensch. Eerste Kl. Kon. Ned. Inst. Wetensch* **4**: 204 (1851) [not seen, citation from Pegler (1983)].

Other synonyms of the preceding species of *Panus* may be found in Pegler (1983). In *Neolentinus* a new name is necessary for the species previously known as *Lentinus* *lepideus* (Fr.: Fr.) Fr. This species is generally agreed to have been named a number of times, the earliest names being *Agaricus squamosus* Schaeff., *A. tubiformis* Schaeff., *Ramaria ceratioides* Holmsk., *A. suffrutescens* Brot. and *A. lepideus* Fr. (Pegler, 1983). Of these names, only *A. suffrutescens* and *A. lepideus* were sanctioned by Fries (1821). Where several synonymous names are sanctioned, priority is given to the oldest published name. Rauschert (1990) realised this in pointing out that *L. suffrutescens* (Brot.: Fr.) Fr was the name to be adopted. In *Neolentinus* the following combination is necessary.

Neolentinus suffrutescens (Brot.: Fr.) comb. nov.

BASIONYM: *Agaricus suffrutescens* Brot., *Fl. Lusit.* **2**: 466 (1804) [not seen, citation from Rauschert (1990)].
A. suffrutescens Brot.: Fr., *Syst. Mycol.* **1**: 177 (1821).
Lentinus suffrutescens (Brot.: Fr.) Fr., *Syst. Orb. Veg.* 78 (1825).
A. lepideus Fr., *Observ. Mycol.* **1**: 21 (1815).
A. lepideus Fr.: Fr., *Syst. Mycol.* **1**: 176 (1821).
L. lepideus (Fr.: Fr.) Fr., *Syst. Orb. Veg.* 78 (1825).
Panus lepideus (Fr.: Fr.) Corner, *Beih. Nova Hedwigia* **69**: 64 (1981).
See Rauschert (1990) and Pegler (1983) for other synonyms.

(3) ***Simocybe.***

According to Kuyper & Bas (1987), *Simocybe* P.Karst. has been generally misinterpreted, and is in fact synonymous with *Phaeocollybia* R.Heim. The correct genus for species previously placed in *Simocybe* as it has been misinterpreted by Singer (1986) and others is *Ramicola* Velen. Watling (1989) has accepted this change.

Ramicola austrorubi (E.Horak) *comb. nov.*

BASIONYM: *Simocybe austrorubi* E.Horak, *New Zealand J. Bot.* **18**: 194 (1980).

(4) ***Pterospora.***

Singer (1986) does not recognise *Pterospora* Métrod at generic rank, but considers that the type species (*Pterospora atrocyanea* Métrod) belongs in *Marasmiellus* Murrill, and that other species placed in *Pterospora* by Horak (1983) [and later in *Tetrapyrgos* E.Horak (Horak, 1987)] belong in *Marasmiellus* or, mostly, in *Campanella* Henn. *Pterospora olivaceonigra* E.Horak was first described from New Zealand (Horak, 1983), and is a common species of south-eastern Australia. A collection from Victoria is illustrated by May (1989). The stipe is lateral, lamellae are intervenose, the pileal context is gelatinised, and basidioles are clavate or only rarely fusoid. *Pterospora olivaceonigra* is therefore best placed in *Campanella.*

Campanella olivaceonigra (E.Horak) *comb. nov.*

BASIONYM: *Pterospora olivaceonigra* E.Horak, *Sydowia* **36**: 131 (1983).
Tetrapyrgos olivaceonigra (E.Horak) E.Horak, *Sydowia* **39:** 102 (1987).

(5) ***Boletus lacunosus.***

Saccardo & Sydow (in Saccardo, 1899) proposed the new name *Boletus cookei* Sacc. & Syd. for the preoccupied *Boletus lacunosus* Cooke & Massee. Kuntze (1898) had, however, validly published the new name *Suillus lacunosus* Kuntze a year earlier [by listing '*Suillus lacunosus* (Cooke & Massee)'] and it is this name which must form the basionym of any combination in *Austroboletus* for the species treated as *Austroboletus cookei* by Watling & Gregory (1986).

Austroboletus lacunosus (Kuntze) *comb. nov.*

BASIONYM: *Suillus lacunosus* Kuntze, *Revis. Gen. Pl.* **3**: 535 (1898) *nom. nov.* for *Boletus lacunosus* Cooke & Massee (1889).
Boletus lacunosus Cooke & Massee, in Cooke, *Grevillea* **18**: 5 (1889) non *B. lacunosus* G.H.Otth. (1857).
B. cookei Sacc. & Sydow, in Sacc., *Syll. Fung.* **14**: 170 (1899) [superfluous *nom. nov.* for *B. lacunosus* Cooke & Massee (1889)].
Porphyrellus cookei (Sacc. & Sydow) Singer, *Farlowia* **2**: 122 (1945).

A. cookei (Sacc. & Sydow) Wolfe, [*Bibl. Mycol.* **69**] *Austroboletus & Tylopilus subg. Porphyrellus* 88 (1979).

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MYCOTAXON

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SEPTORIA ARISTOTELIICOLA SPEC. NOV.

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Summary: The new species *Septoria aristoteliicola* spec. nov. is introduced and compared with *Septoria maqui* P. Henn. (type host: *Aristotelia maqui* L'Her.), described from the botanical garden in Berlin-Dahlem.

Septoria aristoteliicola spec. nov. Fig. 1

Maculae amphigenae, angulares - irregulares, brunneae, dein in centro cinerascentes, 1-20 mm diam., interdum confluentes, per venas limitatae. Pycnidia amphigena, saepe epiphylla, immersa, atra, sparsa vel laxe aggregata, subglobosa - depressa, dein cupulata, 50-100 µm diam. Peridia membranacea, flavido-brunnea, ex cellulis angulosis - rotundatis minutis modice crassitunicatis, saepe 3-8 µm diam., composita, ostiolo subrotundato amplo perforata. Cellulae conidiogenae minutae, ca. 10 x 2 µm, hyalinae, continuae, subcylindricae - sinuosae, leniter geniculatae, monoblasticae, interdum polyblasticae. Cicatrices conidiales inconspicuae, non incrassatae. Conidia solitaria, obclavata, acicularia - fusiformia, 30-60 x 1.5-2.5 (-3.5) µm, 0-3 septata, hyalina, laevia, ad apicem subacuta, basi obconice truncata, hila non incrassata.

Leaf spots amphigenous, angular to irregular, brown, later with greyish centre, 1-20 mm diam., sometimes confluent, vein-limited. Pycnidia amphigenous, mostly epiphyllous, immersed, dark, scattered to loosely aggregated, subglobose-depressed, later cupulate, 50-100 µm diam. Peridium membranaceous, yellowish brown, composed of small, angular to rounded cells with somewhat thickened walls, usually 3-8 µm diam. Ostiolum subcircular, wide, perforating. Conidiogenous cells arising from the inner basal layer of pseudoparenchymatic cells, dense, small, about 10 x 2 μm, colourless, continuous, subcylindric to sinuous, slightly geniculate, monoblastic, occasionally polyblastic, conidial scars inconspicuous, unthickened. Conidia solitary, obclavate, acicular to fusiform, 30-60 x 1.5-2.5 (-3.5) μm, 0-3-septate, apex subacute, base obconically truncate, hila unthickened.

Holotype: on *Aristotelia chilensis* (Molina) Stuntz (Elaeocarpaceae), Argentina, Prov. Rio Negro, N. Huapi Nat. Park, trail to Moreno Lake, Llao Llao, 27-11-1993, M. Havrylenko (HAL).

The conidia are often arranged in whitish cirrhus-like protruding aggregations. *Septoria maqui* P. Henn. is the only additional *Septoria* known on *Aristotelia*. This species was collected on *A. maqui* in the botanical garden of Berlin-Dahlem (Germany). This species has been recorded on the type host from Chile (Spegazzini, 1910; Arentsen, 1949; Oehrens, 1961). Spegazzini (l.c.) provided a full desription and illustration. Arentsen (1952) published a record of this species on *Aristotelia chilensis*. Mujica & Vergara (1980) summarized the South American distribution of *S. maqui*. Type material of *S. maqui* has been re-examined and compared with the present species. The conidia in *S. maqui* are very small. The conidial dimensions of *S. aristoteliicola* and *S. maqui* do not overlap with each other. The latter species is characterized as follows:

Septoria maqui P. Henn., Verh. bot. Ver. Prov. Brandenb. 40: 170 (1898) Fig. 2

Leaf spots amphigenous, subcircular to irregular-diffuse, yellowish to brown, reddish brown, dull greyish brown, mostly terminal or lateral, 5-20 mm diam., margin indefinite or surrounded by a narrow dark brown border. Pycnidia epiphyllous, dark, punctiform, scattered to loosely grouped, 60-110 μm diam., peridium composed of yellowish to medium brown cells, rounded to angular, about 3-6 μm wide, ostiolum moderately wide, up to about 60 μm, perforating. Conidiogenous cells minute, holoblastic, colourless, dense. Conidia solitary, obclavate-fusiform, (10-) 15-25 x 1.5-2.5 μm, (0-) 1 (-2) septate, hyaline, smooth, apex subacute, base obconically truncate, unthickened, protruding cirrhus-like conidial aggregations absent.

Holotype: on *Aristotelia maqui* L'Her., Germany, botanical garden, Berlin-Dahlem, "Südamerikanische Gruppe", 23-7-1898, P. Hennings (B).

There are two original specimens in B from the same locality, but with different data (17-7-1899/23-7-1899). The first collection contains Hennings's original notes. This sample is proposed to serve as lectotype.

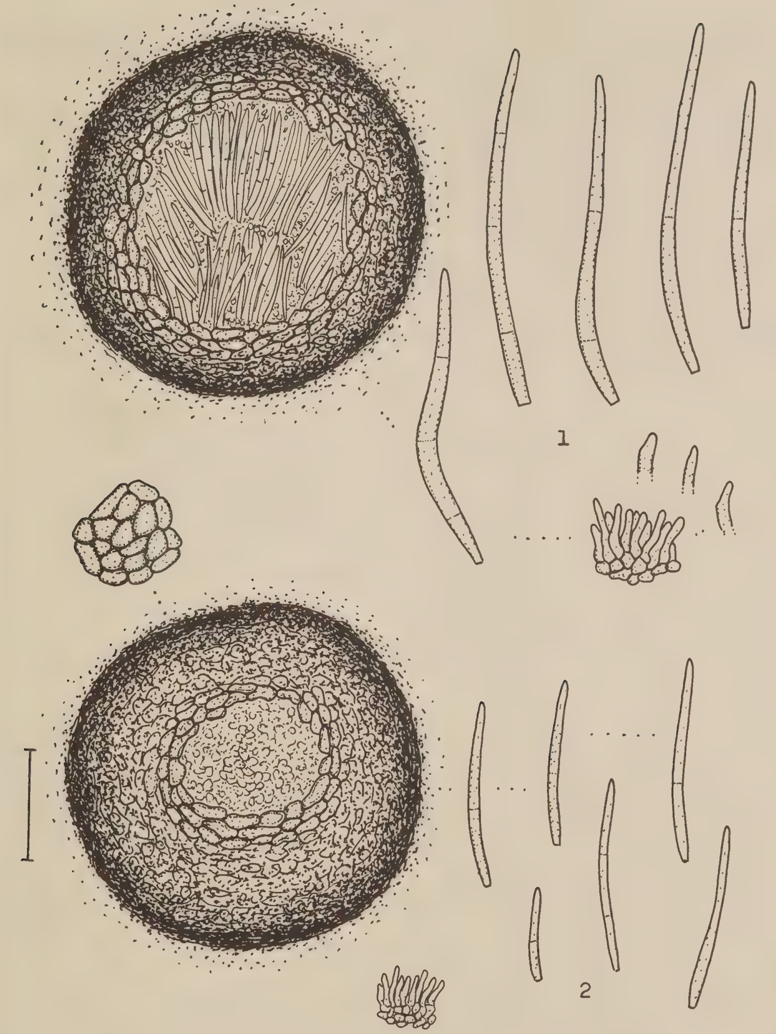

Fig. 1-2: View upon pycnidia, conidia, conidiogenous cells, peridial cells, 1 - *Septoria aristoteliicola* spec. nov., 2 - *Septoria maqui*. Scale - 20 µm. U. Braun del.

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MYCOTAXON

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FEIGEANA SOCOTRANA, A NEW GENUS AND SPECIES FROM SOCOTRA, YEMEN (ROCCELLACEAE; EUASCOMYCETIDAE)

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Abstract: The Socotran genus *Feigeana* is described as new, mainly characterized by its subfruticose thallus and together with the phytochemistry of the hitherto sole species *Feigeana socotrana*. The genus is placed into the Roccellaceae.

keywords: *Feigeana socotrana*, Roccellaceae, Arthoniales, Socotra, Yemen, Indian Ocean.

The lichen genus *Feigeana* Mies, Lumbsch & Tehler was discovered in the eastern part of Socotra, an island incompletely known to lichenology since the works of Müller-Aargau (1882, 1888), Darbishire (1903), and J.Steiner (1907). The geologically isolated position of the Socotran archipelago since late Cretaceous periods has resulted in a large number of endemic taxa, contributing to the evolution of fungi and lichens respectively. There have only been a few collections of lichens in this part of the Eritreo-Arabian flora region - mostly described as endemics - by Balfour, Cockburn & Scott 1880 (in herbarium G), Schweinfurth 1881 (in G), and Simony, Paulay &

Kossmat 1898/99 (in W and WU); a revised lichen checklist was published in Mies, Printzen & Beyhl (1994). Political changes allowed the first author to visit the islands in 1993 and 1994.

Material and methods

The type material was studied from two collections 1993 and 1994 from Socotra by one of the authors. Abbreviations of the herbaria follow Holmgren et al. (1981). Sections of thalli were mounted in water, 10% KOH (K), Lugol's solution (I, = 2g KI + 1g I_2) and lactophenol cotton blue. High performance liquid chromatography (HPLC) of acetone extracts of thalli was carried out using standard methods (Feige et al. 1993). The terms of morphological and anatomical structures refer to Tehler (1990), the phytogeographical categories to Zohary (1973) and Al-Hubaishi & Müller-Hohenstein (1984). The phylogenetical analysis was carried out by using the computer program PAUP 3.0 (Swofford 1991), on an Apple Macintosh PowerBook 170.

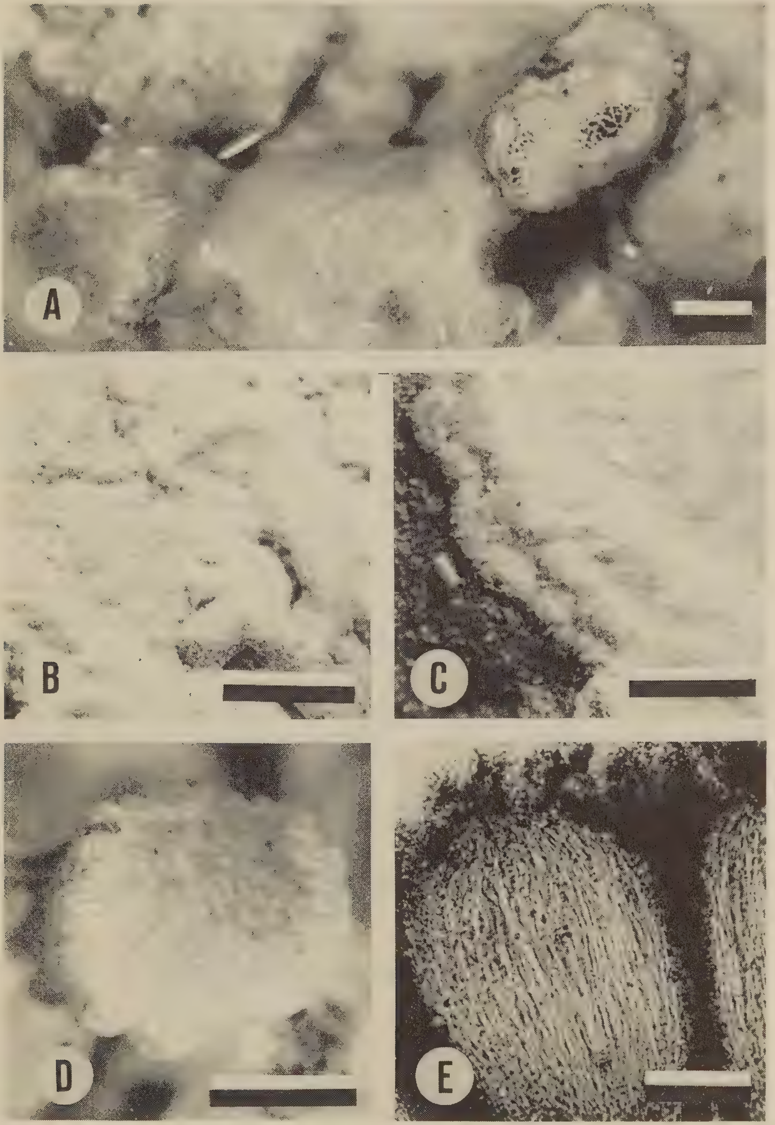
The Genus

Feigeana **Mies, Lumbsch & Tehler** gen. nov.

Thallus subfruticoso-fruticosus de prothallo crustoso emersus, 1-3 mm crassus. Ascomata ovalis atque lirelliforme, in stroma cum margo prominens immersa. Cortex et stroma pruinosi. Margo prothallinus tomentosus.

Typus generis: *Feigeana socotrana* Mies, Lumbsch & Tehler

Fig. 1. Morphology and anatomy of ***Feigeana socotrana*** (holotype): A. Habit in a wet state; B. Rootlike structures at the marginal thallus area; C. Thallus margin and byssoid prothallus; D. Young stroma with prominent thallus margin and pruina. Note the thalline margin with algae and the thick proper exciple; E. Cross section of the upper part of a flask-shaped ascomata under polarized light. Figure E mounted in lactophenol. Scales A to D 1 mm, E 50 µm.


A
B
C
D
E

Thallus emerging from a crustose prothallus becoming wrinkled and subfruticose-fruticose, 1-3mm thick. Ascomata monocarpocentral, oval to lirelliform, embedded in a stroma (synascoma) with prominent margin. Cortex and stroma densely pruinose. Smooth prothallus with a tomentose margin.

The genus is named in honour of Guido Benno Feige (*1938, botanist in Essen), who contributed much to the knowledge of the Roccellaceae.

The Species

Feigeana socotrana Mies, Lumbsch & Tehler sp. nov. figures 1-2

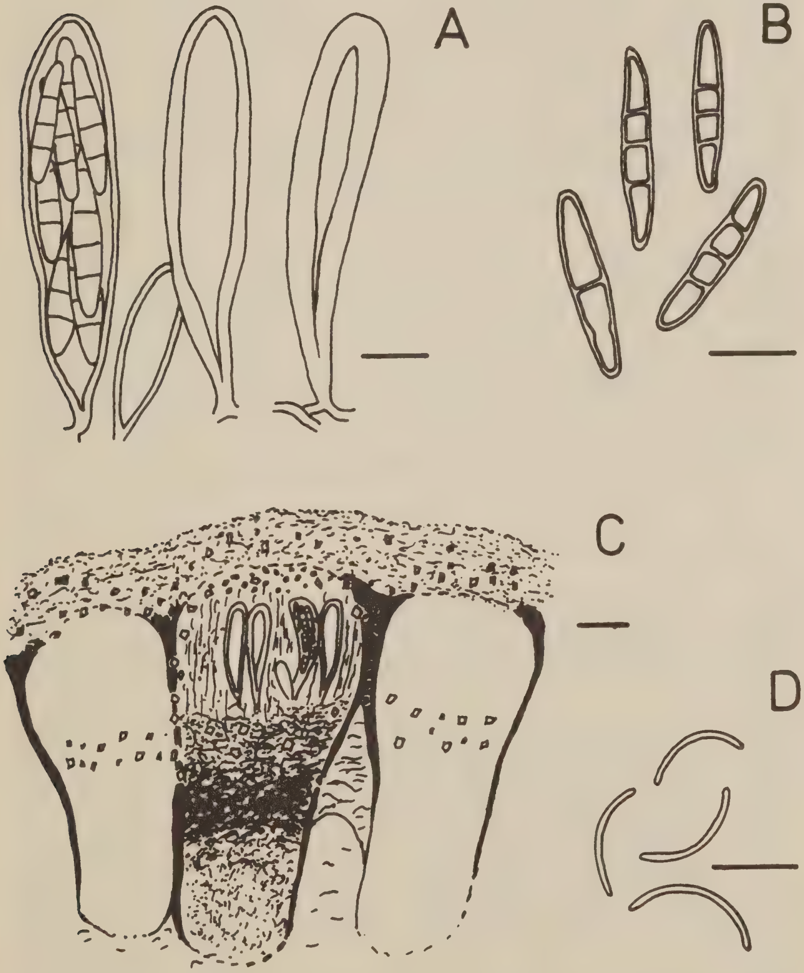
Thallus crustaceus vel subfruticosus, epilithicus, laxe ecorticatus et pruinosus, albus vel cinereoalbus, crystallo repleta, stratum algarum exilis, medulla byssoida. Ascomata in stroma prominens aggregata, 2-3 mm, cum margo thallinus stromarum prominens, albo-pruinosus. Ascomata in stromis immersa, margo thallinus prominens, ovalis vel lirelliformes, 0.1-0.3 x 0.05-0.1 mm. Epihymenium (50-60 µm) memnonium et exteriore albo-pruinosum, excipulum memnonium (8-10 µm), excipulum proprium et subhymenium interiorum subfuscum et in exteriore fuscum. Paraphysoides ramosae et anastomosantes. Asci fissitunicati, cylindrici-clavate, octospori, 65-85 x 16-20 µm, KI+. Ascosporae obovatae et incrassatae, 22-30 x 4-5 µm, (1-)3-septatae, primum incoloratae, demum brunnescentes. Pycnidia immersa: pycnosporae filiforme, curvatae, 13-18 x 1 µm. Acidum lecanoricum continens.

Type: Yemen, Socotra, Muri area in the eastern island part, Ant Kashara, on faces of steep limestone cliffs, 400 m a.s.l., expos.SW, *B. Mies & Chr.Printzen 241*, 13.Jan.1994 (coll.&herb.Mies-no.12863: **holotype** *241,1* to herb. **M**; **isotype** ***241,2*** to herb. **G**)

Further specimen: Socotra (Yemen), [same locality], *B. Mies 99b*, 9.Apr.1993 (Herb.Mies no.12652)

Anatomy and morphology: Thallus 2-3 mm thick, with a densely pruinose, loosely organized cortical layer of interwovenly arranged hyphae, 25-35 µm thick. The algal layer is thin, 25-75 µm, and like the byssoid medulla packed with granular crystals, 8-13 µm (calcium oxalate). The 2-3 mm thick medulla is densely packed with granular deposits of probably calcium oxalate; a hypomedulla is missing.

Fig 2. ***Feigeana socotrana***: A. Mature and juvenile asci; B. Ascospores; C. Ascomata; D. Pycnospores. Scales A, B and D 10 μm, C 30 μm.



Ascomata monocarpocentral, densely pruinose, open oval to later lirelliform, rarely branched. Lirellae 0.1-0.3 x 0.05-0.1 mm, simple to slightly branched, multiply aggregated in a sessile, prominent stroma (synascoma) with a slightly constricted base and 2-3 mm in diameter, circular in outline. Thalline margin of stroma thin when young, later prominent, densely pruinose.

Epihymenium granular, 50-60 µm, I-, KI+, blackish-brown. Hymenium hyaline, 80-120 µm, I-, KI-. Outer exciple extending blackish-brown to the inner part as a parathecium, 8-10 µm thick, containing crystals of calcium oxalate as well. It encloses the brownish hypothecium extending to the inner parts of the medulla and which is becoming pale brown to the central parts. The extension of the hypothecium is flask-shaped, 110-200 µm into the medulla. Following the terminology of Tehler (1990), the ascomata can be described as monocarpocentral, expressing multiascal locules, and as synascoma.

The paraphysoides are branched and anastomosing, 1-1.5 µm wide, with apical cells usually smooth and hyaline and not thickened, but the individual hyphae are not easily discerned. The asci are fissitunicate, cylindro-clavate, eight-spored, 65-85 x 16-20 µm, ectotunica I-, KI-, endotunica I-, KI+. Ascospores fusiform and often slightly curved with thickened walls and septa, 22-30 x 4-5 µm, (1-)3-septatae, at first hyaline, in maturity walls and septa brownish.

The pycnidia are immersed, having filiform and curved pycnospores.

Chemistry: Thallus and medulla K-, C+ red, KC+, PD-; lecanoric and traces of orsellinic acids detected by HPLC.

Notes: The ascomata are similar to those of *Syncesia* and *Chiodecton*. The genus *Feigeana* is distinguished by the subfruticose morphology, the phytochemistry, the habitat, and the biogeographical distribution (actually known).

Feigeana complies with the criteria for which Arthoniales are diagnosed (Tehler 1990; Tehler 1993b). In order to determine its phylogenetic position within the order Arthoniales the data set used in *Feigeana socotrana* was added to the data set in Tehler (1990). The data coded for *Feigeana socotrana* in the new matrix was 11012 ??211 ?2111 110?1 10000 0012? 10?0? (0&1)(0&1)021 12201 21111 12212 11200 11111 11202 10211 01010 00001 00000 11 consecutively following Tehler (1990). Character exclusions and command and option settings for the phylogenetic analysis computer program were set the same as in previous analysis (Tehler 1990). Five terminals, *Cookella*, *Arthothelium*, *Arthonia*, *Chiodecton* and *Schismatomma* were excluded from the original data set and the present cladogram was rooted with the genus *Syncesia* (Tehler 1993b; Tehler 1995) which is the sister group to the families Opegraphaceae and Roccellaceae

(Tehler 1993a, b). Three trees were obtained with a length of a 204 steps, a consistancy index of 0.379 and a retention index (Farris 1989) of 0.439.

As a result of the present analysis it was clear that *Feigeana* should be included in the family Roccellaceae (Arthoniales). That family has been shown to be a well corroborated group (Tehler 1990; 1993b) something which is supported also by the present analysis. However, some of the subgroups in Roccellaceae were known to be unstable and unconvincingly supported and as was predicted already in Tehler (1990), rearrangements could be expected when additional taxa were to be included in future analyses. The inclusion of *Feigeana* in the data set resulted in some considerable changes in tree topology within Roccellaceae, although the gross topology is still supported. *Feigeana socotrana* forms a sister pair with the endemic species *Hubbsia lumbricoides* from Isla Guadalupe outside the coast of Baja California, Mexico. *Feigeana* and *Hubbsia* in turn, make up the sister group to the sister pair *Combea mollusca* and *Dolichocarpus chilensis*, the former endemic to the Cape Province in South Africa and the latter endemic to the central parts of the Chilean west coast. Hence, *Dolichocarpus chilensis* has been transferred from the clade with *Darbishirella*, *Gorgadesia* and *Roccellographa* in Tehler (1990) over to the clade with *Schizopelte*, *Hubbsia*, *Combea*, *Dirina* and *Roccella*.

The new cladogram is still unconvincingly supported which is evident from the low consistency index and the low Bremer support index (Bremer 1988) of only 1, i.e. hitherto the cladogram collapses when trees one step longer than the shortest tree are included. Hence, firm relationships within the family are to be awaited .

Distribution and habitat: *Feigeana socotrana* is hitherto only known from the type locality. The Eocene reef complex of Ant Kashara is deeply furrowed into 3 to 8 m high limestone blocks with steep faces, which are densely covered by *Trentepohlia* lichens of the Roccellaceae, Opegraphaceae, Arthoniaceae, etc. beneath huge *Dracaena cinnabari* trees (Mies & Zimmer 1993). At an elevation of 400 m a.s.l. the locality is still influenced by the fringes of air-blown sea foam, which - together with high aridity - merely enables halotolerant or halophytic plant species to grow (Mies & Zimmer 1993). *Feigeana socotrana* was accompanied by *Dirina massiliensis, D. immersa, Helminthocarpon* spp., *Roccellina cinerea, Rocccellographa cretacea, Simonyella variegata, Arthonia cinnabari*, and a overwhelming wealth of opegraphaceous and chiodectonaceous species.

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We wish to express our thanks to the colleagues Fritz Beyhl, Christian Printzen, Hans and Helga Zimmer, who took part in the expeditions 1993 and 1994 to Yemen and Socotra, the *Heinrich und Erna Walter Stiftung* and the *University of Düsseldorf*, which supported the field-work.

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A study of the genus Phanerochaete (Aphyllophorales) with brown subicular hyphae

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ABSTRACT

Five species of the genus Phanerochaete with brown subicular hyphae have been studied. Specimens including types of P. brunnea, P. fuscomarginata and P. singularis were reexamined for their macroscopic and microscopic characters. A new combination, P. monomitica, is proposed. P. stereoides, collected from Taipei, Taiwan, is presented as a new species. Moreover, cultural studies for P. brunnea and P. stereoides are given.

INTRODUCTION

Phanerochaete Karst. is a relatively abundant genus in family Corticiaceae, with more than fifty species worldwide (Burdsall 1985, Hjortstam 1987 and Wu 1990). Most members of the genus Phanerochaete are with hyaline subicular hyphae, but some species in this genus consists of a unique brown subicular hyphae. First member (P. fuscomarginata) of Phanerochaete with brown hyphae was noted by Gilbertson et al. (1972). In 1985, a second species (P. singularis) of this group was proposed by Burdsall (1985). He noted that "the yellow-brown tinted hyphae are not typical of Phanerochaete, but the other microscopic characters agree well". Recently, Wu (1990) found a third species (P. brunnea) which also have the brown subicular hyphae.

In July of 1991, a brownish basidiomycete on dead angiosperm branch with a fairly large fruiting body, was collected from lowland of northern Taiwan. The fruiting body is effuse · with recurved margins, having fairly tough consistency. The macroscopic characters look alike to a member of genus Stereum Pers. However, its microscopic features indicate that this species represents a Phanerochaete species with brown subicular hyphae. In this paper, I propose this species, P. stereoides, as new to science. In addition, I examined two specimens of *Duportella monomitica* and found that features of these two specimens match those of genus *Phanerochaete*. Therefore, a new combination is also proposed in this study.

Members of this brown hyphae group have been referred as other genera. For example, *Peniophora fuscomarginata* Burt was transferred by Gilbertson (Gilbertson et al. 1972) to *Phanerochaete*, but was considered by Burdsall (1985) as more appropriate in *Peniophora* Cooke. *Duportella monomitica* G.H. Cunn. was placed by Hjortstam & Ryvarden (1990) in *Porostereum* Pilát. The placements were largely based on the presence of brown hyphae of most species of these genera. However, the resemblances are superficial. *Phanerochaete fuscomarginata* is not in possession of two main features of *Peniophora*, the presence of either lamprocystidia or gloeocystidia and pale-red spore deposit. Moreover, the brown hyphae in subiculum of *Phanerochaete monomitica* are generative hyphae, not the brown skeletal hyphae which normally present in *Duportella* Pat. and *Porostereum*.

The present study examines all five known species of this brown subicular hyphae group using morphological comparisons and cultural studies. Objectives of this study are to make differences among species of this unique group, and to propose a proper generic placement of this group in taxonomy.

MATERIALS AND METHODS

Methods for morphological studies of fruit bodies, including both macroscopic and microscopic characters have been described by Wu (1990). Cultural codes are from Nobles (1965) with amendments by Boidin and Lanquetin (1983). Other modifications included incubation of cultures at 25 ℃ and plates inverted. The inverted plates correspond to the orientation of fruit body formation in nature. Drop tests for extracellular oxidases follow Marr (1979). Nuclear stainings were made with Giemsa according to Boidin (1958). Terminology for nuclear behaviour is based on Boidin and Lanquetin (1984).

Abbreviations of the herbaria follow Holmgren et al. (1990). Many specimens are deposited at National Museum of Natural Science of ROC, which is abbreviated as N.M.N.S.

Key to species of *Phanerochaete* with brown subicular hyphae:

1. Basidiospores wider than 3.2 μm 3
1. Basidiospores narrower than 3.2 μm 2
2. Basidiospores usually longer than 5.5 μm .... *P. singularis*
2. Basidiospores shorter than 5.5 μm .... *P. brunnea*
3. Fruit body pinkish buff, fairly soft. Subicular hyphae simple-septate, single and double clamps occasionally present, brown ones only present next to substratum .... *P. fuscomarginata*

3. Fruit body greyish brown or pale brown, fairly hard.
   Subicular hyphae simple-septate, brown................. 4
4. Cystidia present .... P. stereoides
4. Cystidia lacking .... P. monomitica

1. **Phanerochaete brunnea** S.H. Wu, Acta Bot. Fennica 142:42, fig. 25. 1990.

Descriptions and figures of this species can be referred to the protologue (Wu 1990), except that the fruit body description should be slightly emended. In the protologue, descriptions were based on the type specimen which forms small patches on an angiosperm branch. Additional collections reveal that the fruit body of this species may grow as broadly effuse. In this study, basidiospore dimensions were measured using spore-prints of two specimens, and the results are as below.
Wu 910619-22: (4.0-) 4.2-5.3 (-5.5) x 2.5-3.0 μm ($\bar{X}$= 4.83 ± 0.39 x 2.69 ± 0.14 μm, n = 30). Wu 910808-9: (4.0-) 4.2-5.1 (-5.3) x 2.5-3.3 μm ($\bar{X}$ = 4.80 ± 0.37 X 2.87 ± 0.22 μm, n = 30).

Specimens examined: Taiwan. Nantou: Lienhuachih (23"59' N, 120"33' E), alt. 700 m, on branch of angiosperm, 25.X.1988, Wu 1025-23 (H, holotype); 19.VI.1991, Wu 910619-22 (N.M.N.S.). Ilan: Fushan Nature Reserve (24"47' N, 121"33' E), alt. 600 m, on branch of angiosperm, 8.VIII.1991, Wu 910808-9 (N.M.N.S.).

Distribution: Known only from Taiwan.

Cultural studies:
[from polysporous mycelium of Wu 910808-9]
1 wk growth: Colony radius 45-55 mm. Advancing zone even. Mats white. Aerial mycelium almost absent. 2 wk growth: Colony covered. Advancing zone even. Mats white. Aerial mycelium almost absent.
6 wk growth: Mats slightly brown, especially close to the plate margins. Aerial mycelium almost absent, but slightly cottony close to the plate margins. Hyphal system monomitic. Aerial hyphae hyaline to brown, sparsely ramified, distinct, usually simple-septate, single or double clamps occasionally present, 2.5-5.0 μm diam, thin- or slightly thick-walled. Immersed hyphae hyaline, usually not so straight as the aerial ones, moderately ramified, occasionally irregularly inflatted, mostly simple-septate, rarely with single or double clamps, 2-10 μm diam, thin- or slightly thick-walled. Cubical crystals present. No distinct odor. Not fruiting.

Oxidase reactions: Syringaldazine (-), 1-Naphthol (-), L-tyrosine (-), p-Cresol (-).

Cytology: Basidiospores binucleate. Monosporous mycelium with multinucleate cells. Polysporous mycelium with multinucleate cells.

Nuclear behaviour: Holocoenocytic.

Nobles code: 1, 5, 7, 32, 37, 42, 54, (57), 66.

Data obtained from cultural studies in P. brunnea strongly support the placement of this group in genus Phanerochaete. Evidence includes the monomitic hyphal system, quick growth of mycelium, occasional presence of single or double clamped hyphae, as well as the holocoenocytic nuclear behaviour.

2. **Phanerochaete fuscomarginata** (Burt) Gilb. in Gilb., Canfield & Cummins, J. Arizona Acad. Sci. 7:135, fig. 28. 1972.
≡ Peniophora fuscomarginata Burt, Ann. Missouri Bot. Gard. 12:335. 1926.

A description based on holotype of this species, is given as below.

Fruit body effuse, separable, membranaceous, 250-400 µm thick in section. Hymenial surface pinkish buff to warm buff (color description according to the protologue), turning brick-red in KOH, smooth, occasionally cracked; margin of a brown immature zone.

Hyphal system monomitic. Subiculum fairly uniform, composed of medullary layer, with ± loose texture; hyphae pale brown and ± horizotal next to substratum, hyaline and variously oriented near subhymenium, fairly straight and distinct, mostly simple-septate, occasionally with single and double clamps (especially the brown ones near substratum), 3-8 µm diam, with 0.5-1.5 µm thick walls, usually with numerous small oil-drops. Subhymenium differentiated from subiculum, thickening, with compact texture; hyphae mainly vertical, hyaline, narrower than those of subiculum, thin-walled, with numerous small oil-drops. Leptocystidia very few, narrower towards apices, emmergent, hyaline, 50-60 x 5.5-6.5 µm. Basidia clavate, 25-35 x 6-7 µm, 4-sterigmate. Basidiospores narrowly ellipsoid, adaxially flattened or slightly concave, smooth, thin-walled, 6.5-8.5 x 3.5-4.5 µm, IKI-, CB-.

Phanerochaete fuscomarginata is similar to the new species, P. stereoides by the basidiospores and the cystidia. Differences between them are given in remarks of the latter species. In descriptions of this species, both from the protologue (Burt 1926) and that by Liberta (1968), the subicular hyphae were described as simple-septate. In my studies of the holotype, single and double clamps from the subicular hyphae were occasionally observed, especially from the brown ones near the substratum. Phanerochaete fuscomarginata was regarded by Burdsall (1985) as a Peniophora Cooke, due to the presence of brown subicular hyphae and the proliferating basidia. However, resemblance of the characteristics in P. fuscomarginata, is superficial. Two main features of Peniophora, i.e., the existence of either lamrocystidia or gloeocystidia, and the pale-red spore print, are not described in this species. Cultural studies by Nakasone (1990) support the placement of this species in Phanerochaete.

Specimen examined: U.S.A. Louisiana: St. Martinville, on bark, A.B. Langlois 100, 15.VII.1897, (holotype, FH).

Distribution: Known only from southern USA.

3. **Phanerochaete monomitica** (G.H. Cunn.) S.H. Wu & Popoff, comb. nov.
Basionym: Duportella monomitica G.H. Cunn., Trans. Roy. Soc. New Zealand 85:98, fig. 4. 1957.
= Porostereum monomiticum (G.H. Cunn.) Hjortst. & Ryv., Syn. Fung. 4:41, fig. 12. 1990.

Descriptions and figures of this species can be referred to Cunningham (1963:298-299) and Hjortstam and Ryvarden (1990:40-41). Cunningham (1957) classified this species as monomitic, and apparently he noticed this characteristic and used it as the epithetic name. However, Hjortstam and Ryvarden (1990) redescribed this species as dimitic and placed it to the genus Porostereum Pilát. In studying specimens of this species, I could only find the brown and thick-walled generative hyphae in the subiculum. The skeletocystidia which were described by Hjortstam and Ryvarden (1990) in this species, for me, are terminals of subicular hyphae. Therefore, I suggest this species should be monomitic.

Specimens examined: New Zealand. Auckland: Great King Island, on Leptospermum ericoides, I.1952, leg. E.E. Chamberlain, det. G.H. Cunningham (PDD 11385); Huia, Monument Rd., I.1954, leg. E.E. Chamberlain, det. G.H. Cunningham (PDD 16698). Argentina. Corrientes: Ituzaingó, Isla Apipé Grande, Monte Grande, interior de selva, 26.XI.1988, leg. O. Popoff et al. 602 (CTES, N.M.N.S.); Capital, Richuelo, en selva degradada, 28.IX.1990, leg. O. Popoff 729 (CTES, N.M.N.S.). Paraguay. Itapúa: Alto Paran, Reserva Biol. Itabó, 6 km N de la Administración, interior de la selva, 9.X.1990, leg. O. Popoff & Caballero 800 (CTES, N.M.N.S.).

Distribution: New Zealand, Argentina, Paraguay.

4. **Phanerochaete singularis** (G.H. Cunn.) Burds., Mycol. Mem. 10:121, fig. 39. 1985.
≡ Corticium singulare G.H. Cunn., Trans. Roy. Soc. New Zealand 82:325. 1954.

≡ Grandiniella singularis (G.H. Cunn.) Burds., Taxon 26:329. 1977.
≡ Phanerochaete singularis (G.H. Cunn.) Stalp. (comb. invalid pro syn.), New Zealand J. Bot. 23:309. 1985.

Descriptions and figures of this species see Cunningham (1963:91-92) and Burdsall (1985:121-123). This species is very similar to P. brunnea, but with longer basidiospores than the latter. Burdsall (1985) measured basidiospores of this species as 5.5-7.5 x 2.5-3.5 μm. A re-measurement taken from the same specimens in this study, is 5.0-6.5 x 2.5-3.0 μm. Both measurements of the basidiospores are somewhat longer than those of P. brunnea specimens (4.5-5.5 x 2.3-3.0 μm). In addition, P. brunnea is with simple-septate hyphae, but single and double clamps are occasionally present in subicular hyphae of P. singularis.

Specimens examined: New Zealand. Auckland: Rotorua, Waiotapu, 17.VI.1950, on Litsea calicaris, coll. J.M. Dingley, PDD 10589 (holotype); Auckland: Waipoua, on Beilschmiedia tarairi, I. 1955, coll. J.M. Dingley, PDD 14158.

Distribution: New Zealand and Australia.

5. **Phanerochaete stereoides** S.H. Wu, sp. nov. (Fig. 1)

Basidiocarpum effusum, membranaceum, 150-300 μm crassum; superficies hymenialis plana. Systema hypharum monomiticum; hyphae vulgo efibulatae, brunneae. Cystidia prope cylindrica, tenuitunicata. Basidia clavata, 26-36 x 5-7 μm, 4 sterigmatibus. Basidiosporae anguste ellipsoideae, laeves, tenuitunicatae, (6.0-) 6.5-8.0 x 3.2-4.0 μm, IKI-, CB-.

Holotypus: Taiwan. Taipei: Kungliao (25"00' N, 121"54' E), alt. 200 m, on branch of angiosperm, 25.VII.1991, leg. S.H. Wu, Lin 523 (N.M.N.S.; isotypi: LY, TAI).

Etymology: Referring to the resemblance of fruit body of this new species, to that of the genus Stereum.

Fruit body at first of orbicular patches, then effuse, ± adnate or separable, membranaceous, 150-300 μm thick in section. Hymenial surface pale grayish-brown, no distinct color changes in KOH, smooth, not cracked; margin white and filamentose when attached to substratum, but often separate from substratum and recurved, and concolorous in this condition.

Hyphal system monomitic; hyphae simple-septate. Subiculum fairly uniform, composed of medullary layer, with ± dense texture; hyphae ± horizontal, moderately ramified, distinct, sometimes fairly straight, brown, 3-6 μm diam, with 0.5-2.0 μm thick walls. Subhymenium differentiated from subiculum, somewhat thickening, with compact texture; hyphae vertical, hyaline, much narrower than those of subiculum, thin-walled. Cystidia projecting for approximately half their lengths, hyaline, sparsely covered with crystals, nearly cylindrical but somewhat median-swollen and tapering towards apices, 60-75 x 5-7 µm, thin-walled. Basidia narrowly clavate or clavate, 26-36 x 5-7 µm, 4-sterigmate. Basidiospores narrowly ellipsoid, adaxially flattened or slightly concave, smooth, thin-walled, sometimes with several oil-drops, (6.0-) 6.5-8.0 x 3.2-4.0 µm, IKI-, CB-.

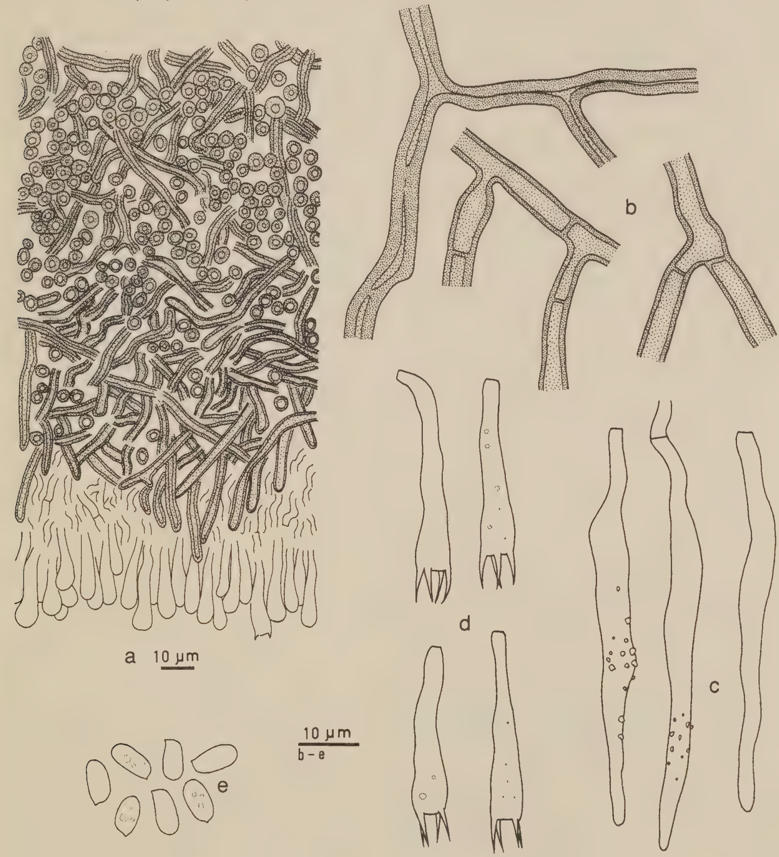

Fig. 1. _Phanerochaete_ _stereoides_ (holotype). a) Fruit body section, b) subicular hyphae, c) cystidia, d) basidia, e) basidiospores.

The brown and thick-walled generative hyphae of Phanerochaete stereoides, are resemble to the normal skeletal hyphae which bearing numerous secondary septa. The lack of other kind generative hyphae in the subiculum, excluding the possibility of dimitism in this species. Additionly, the hyaline and thin-walled subhymenial hyphae are arising from the brown, thick-walled hyphae, again proving the brown ones are generative hyphae. In culture, generative hyphae of aerial mycelium are hyaline to brownish, thin- to thick-walled, and the changes are continuous. This indicates that the brown and thick-walled hyphae are not different from generative hyphae.

This new species is similar to Phanerochaete monomitica by the nature of brown subicular hyphae, and the almost same sized basidiospores. Two major differences are: First, hymenial surface of P. monomitica is usually cracked, but it is not cracked in the well-developed type specimen of P. stereoides. Secondly, P. monomitica totally lacks the projecting thin-walled and hyaline cystidia, whereas these features are present in P. stereoides.

This new species is also similar to P. fuscomarginata by the similar sized basidiospores and the cystidia. However, fruit body consistency and colors are distinctly different between these two species. P. fuscomarginata is pinkish buff and fairly soft, but P. stereoides is greyish brown and fairly hard. In addition, subicular hyphae of P. stereoides are totally brown and simple-septate, whereas those of P. fuscomarginata are pale brown next to substratum to hyaline near subhymenium. The single and double clamps are occasionally present in P. fuscomarginata.

Specimen examined: Taiwan (see type).

Distribution: Known only from Taiwan.

Cultural studies:

[from polysporous mycelium of Lin 523]

1 wk growth: Colony radius ca. 75 mm. Advancing zone sparse and uneven. Mats white. Aerial mycelium absent. 2 wk growth: Colony covered.

6 wk growth: Mats white and fairly sparse where aerial mycelium indistinct, pale brown aerial mycelium irregularly present, pellicular to woolly, sometimes tuberculate in shape. Sometimes the tubercles covered with brownish excreted-drops. Aerial hyphae usually simple-septate, hyaline to brownish, 2-6 μm diam, with thin to thick walls, fairly straight and sparsely ramified, the wide and thick-walled ones deeper in color. Immersed hyphae mostly simple-septate, rarely with single or double clamps, 1.5-8.0 μm diam, hyaline, usually not so straight as the aerial ones, thin- to thick-walled, wide ones sparsely ramified, narrow ones frequently ramified. No distinct odor. Not fruiting.

Oxidase reactions: Syringaldazine (-), 1-Naphthol (-), L-tyrosine (-), p-Cresol (-).

Cytology: Basidiospores binucleate. Monosporous mycelium with multinucleate cells. Polysporous mycelium with multinucleate cells.

Nuclear behaviour: Holocoenocytic.

Nobles code: 1, 5, 7, 25, 37, 38, 42, 54, (57), 66.

In having the same reasons as in P. brunnea, data obtained from cultural studies in P. stereoides also support the placement of this group in genus Phanerochaete.

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LECTOTYPIFICATION OF WETTSTEININA NIESSLII (DOTHIDEALES S.L., ASCOMYCETES)

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The type specimen of the caricicolous ascomycete *Wettsteinina niesslii* E. Müll. s.str. (Basionym: *Leptosphaeria gigaspora* Niessl) from the Saccardo herbarium in PAD has been examined and designated as the lectotype. The species seems to be rare, and nearly all other collections published as *W. niesslii* (or *L. gigaspora*, resp.) must be excluded. Apparently, *Didymella caricis* H. Syd. is closely related.

Key words: *Leptosphaeria gigaspora*, Pseudosphaeriaceae, Massarinaceae, Lophiostomataceae, lectotypification, taxonomy.

Introduction

Niessl (in Winter 1883: 181) has described *Leptosphaeria gigaspora* in the '*Repertorium*' of '*Rabenhorstii Fungi europaei et extraeuropaei*'. After the short Latin diagnosis of a coelomycete, no. '2998. *Hendersonia gigaspora* Niessl nov. spec.', he gives a very brief description of this ascomycete that he found to be similar to his new *Hendersonia*:

> 'Auf den Blättern von *Carex paludosa* fand ich vor Jahren eine übereinstimmende Form in Begleitung einer *Leptosphaeria* mit fast ebenso großen Schlauchsporen. Diese sind lanzettlich, in der Mitte stark eingeschnürt, mit 6-8 kugeligen Kernen, aber noch ohne Scheidewände und offenbar noch nicht völlig ausgebildet. Sie wurde von mir als *L. gigaspora* in sched. bezeichnet und wahrscheinlich gehört hierzu auch die vorliegende Macrostylosporenform; doch konnte ich auf diesem Substrat [*Carex montana* L.] die Schlauchform nicht finden.'

If no or only very poor syntype material had survived, it would have been easy to drop the name *Leptosphaeria gigaspora* sensu Niessl completely or to designate a neotype as soon as the species was collected again. Recently, a satisfactory syntype specimen of *L. gigaspora* from the Saccardo herbarium in PAD, most probably the collection described and illustrated by Berlese (1894: 70; Tab. LVII/1), has become available. It agrees with Berlese's illustrations, but a brief re-description seems appropriate. Mounts of dried herbarium material were prepared in various media (tap water, 1% KOH, lactic blue) and observed in bright field LM.

Müller (1950: 204) assigned *Leptosphaeria gigaspora* to the genus *Wettsteinina*, but the epithet had to be changed because of the existence of *W. gigaspora* Höhn., the type species of the genus. Although *W. niesslii* does not agree with *W. gigaspora* in several respects, the species is retained provisionally in this genus. No other, more suitable genus is available, and it seems premature to describe a new monotypic genus in the largely unresolved tangle of herbicolous and graminicolous bitunicate species with hyaline, mostly 1- or 3-septate ascospores, where a number of characters should be re-examined with regard to possible convergent lines of evolution. Finally, at least one very similar species in the genus *Wettsteinina*, *W. candida* Shoemaker & Babcock (1987: 377), also has large fusiform ascospores, numerous asci and interascal filaments, and a similar, but more rudimentary epidermal clypeus.

Wettsteinina niesslii E. Müller, Sydowia 4: 204 (1950) Figs. **A - G**

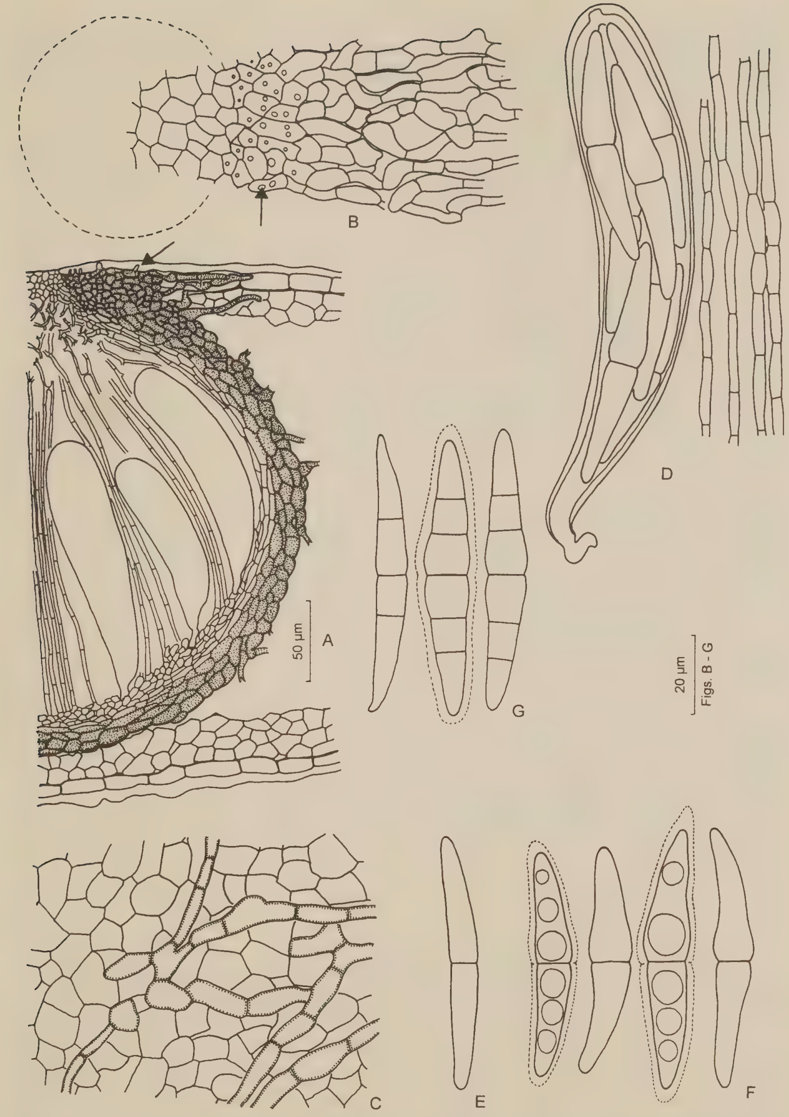
Basionym: *Leptosphaeria gigaspora* Niessl in Winter, Hedwigia 22: 181 (1883), non *Wettsteinina gigaspora* Höhn.
Other descriptions: Berlese 1894: 70 and Tab. LVII/1, Saccardo 1883: 65, Winter 1887: 450.

Ascomata (Pseudoperithecia) completely immersed in the substratum, globose, 230-320 µm in diameter, with a distinct, blackish, circular clypeus (115-165 µm in diameter) of epidermis cells invaded by dark brown hyphae, without an erumpent papilla. The cells of the clypeus are densely packed and ± irregular in shape; in longitudinal section small protrusions from the clypeus cells into the cuticle can be observed; in surface view these protrusions appear as bright, circular dots ca. 1-1.5 µm in diameter. Ostiole at first closed with small, angular, thin-walled, ± isodiametric cells, appearing as a little silvery disc in the middle of the clypeus in surface view, finally ca. 40 µm in diameter. Peridium ca. 20-25 µm thick, composed of 3 - 4 outer layers of cells with blackish walls and 1 - 2 inner layers of cells with colourless walls, individual cells of the outer layers slightly flattened, irregularly angular in surface view, with sparse concolorous surface hyphae. Interascal filaments (pseudoparaphyses?) hyaline, ca. 3-4.5 µm wide. Asci bitunicate (fissitunicate), 8-spored, broadly clavate, 140-150 x 25-30 µm, thick-walled. Ascospores fusiform, 55-70 x 9.5-12 µm, with a distinct, sharply delimited gelatinous coat, hyaline, 1-septate, septum median; 2 - 3 large, spherical guttules in each hemispore. Senescent ascospores brown, with one or two additional septa in each hemispore; a very slight punctiform wall ornamentation has been observed in one senescent ascospore from the specimen on *Carex pendula* (Schroeter, M).

Lectotypus designated here: *Leptosphaeria gigaspora* Niessl in herb., in foliis *Caricis paludosae* Good. [= *C. acutiformis* Ehrh.], [Moravia,] Brünn, aestate, Niessl (Herbarium Mycologicum P. A. Saccardo, PAD).
Other specimens examined: *Leptosphaeria gigaspora* Niessl in herb., auf *Carex maxima* Scop. [= *C. pendula* Huds.], [Germany,] Freiburg i. B., Nov. 1876, Dr. Schroeter (M). - *Leptosphaeria gigaspora* Niessl, auf *Carex acuta*, [Germany,] Wiesbaden, 1 Sept. 1963, R. Steppan (M).

Anamorph: The ontogenetic connection between the coelomycete *Hendersonia gigaspora* Niessl, currently named *Stagonospora gigaspora* (Niessl) Sacc., and the ascomycete *Leptosphaeria gigaspora* assumed by Niessl (in Winter 1883: 181) has not yet been established in pure culture. *Stagonospora* anamorphs have already been confirmed for species of *Massarina*, *Phaeosphaeria* (e.g., Leuchtmann 1984), and for *Didymella proximella* (P. Karst.) Sacc. (Corlett & Smith 1978).

Distribution: The species is apparently rare, only these three specimens from Moravia and Germany, resp., have so far been located.



Figs. **A-G**: ***Wettsteinina niesslii*** **A** Half longitudinal section of ascoma. - **B** Sector of epidermal clypeus in surface view; note the bright, dot-like protrusions (arrowed) of the clypeus cells into the cuticle (epidermis cell walls omitted). - **C** Peridium with surface hyphae in surface view. - **D** Ascus and interascal filaments. - **E-G** Ascospores: **E** young, **F** mature, **G** senescent. - [Lactic blue slides; A-D Lectotype, PAD; E-G Schroeter, M].

There are two major differences between the measurements in the descriptions of earlier authors and the present lectotype: (1) fruit body size: Berlese (1894: 70) gives $^1/_7$ - $^1/_5$ mm; this might be the size of the accompanying *Stagonospora* pycnidia rather than the larger ascomata of *W. niesslii*. (2) ascospore length: The longest ascospores in the present collection measure 70 µm, about 8-10 µm longer than the measurements given by Berlese (1894: 70) and Müller (1950: 205), and 15 µm longer than those in Winter (1887: 450). In spite of this discrepancy, the ascospore proportions in Berlese's (1894: Tab. LVII/1) drawing are correct, and the doubts raised by Scheuer (1988: 188, 257) were not adequate.

The former syntype specimen of *W. niesslii* from the Niessl collection in M, apparently from a different locality in Moravia (*Leptosphaeria gigaspora* n.sp., auf *Carex paludosa*, ...[handwriting illegible] bei Brünn, Niessl) does not contain any well developed ascomata of this species. Only one small leaf fragment with some empty fruitbodies that might have been *W. niesslii* could be found in this collection. The other leaves in this syntype specimen still bear numerous pycnidia of a large-spored *Stagonospora*, most probably Niessl's *Hendersonia gigaspora*, but no ascomata of *W. niesslii*. It is necessary to designate a lectotype because Niessl has not given any detailed collecting data with the protologue.

A specimen from North Sweden (on leaves of *Carex saxatilis x vesicaria*, Torne Lappmark, Jukkasjärvi s:n, Vassitjåkka, 16 Aug. 1936, J. A. Nannfeldt; UPS), listed by Eriksson (1992: 112) is included here with some reluctance. It is definitely very close to *W. niesslii* s.str., but because the morphological variability of *W. niesslii* is poorly known, studies of further collections will be necessary to determine whether this one can safely be regarded as conspecific. The following differences should be noted: (1) The peridium is slightly thinner, less pigmented, pale to middle brown in transmitted light, but with a conspicuous tomentum of concolorous, densely interwoven hyphae. (2) The ascospores are slightly shorter (55-60 µm) and they apparently become (3-4-)5-septate already before discharge (septation sequence usually 3:2:1:2:3). In fully mature ascomata a few asci containing pale brown, 5-septate ascospores with distinctly punctate walls have been observed. Occasionally 6-septate ascospores occurred (septation sequence 4:3:2:1:2:3), very similar to those of *W. candida* Shoemaker & Babcock (1987: 377), but the ascospores of this species are regularly 6-septate (septation sequence 4:3:2:1:2:4).

Excluded taxa and specimens

The collections on *Carex paniculata* L. treated as '*Wettsteinina* cf. *niesslii*' by Scheuer (1988: 187) are very similar to the lectotype of *W. niesslii*, but definitely smaller in all parts, with a delicate, macroscopically ± indiscernible epidermal clypeus, like in *W. candida* Shoemaker & Babcock (1987: 377). The material in herb. Scheuer is too scant to select a type specimen, therefore the species on *Carex paniculata* has to remain unnamed. The species reported by Pugh (1958: 187) as '*Leptosphaeria*? *gigaspora*', also on *Carex paniculata*, is probably identical with Scheuer's '*Wettsteinina* cf. *niesslii*', but it has not been examined. Another fungus almost identical with *W. niesslii* in microscopical structure, but much smaller in all parts is *Didymella caricis* H. Sydow (1921: 305), a species which seems to be more common than *W. niesslii* (e.g., Scheuer 1988: 65); it has also been reported from the Isle of Skye (Scotland) by Spooner & Dennis (1986: 296).

The fungus on ***Phragmites australis*** (Cav.) Trin. ex Steud. described by Müller (1950: 204; ZT) as *W. niesslii* has been re-examined. For a description of the ZT specimen see Shoemaker & Babcock (1987: 391, as *Lophiostoma* species 2). Although the ascospore measurements agree very well with the present lectotype, it is not conspecific and apparently not congeneric with *W. niesslii* s.str. It should be noted here that the gelatinous appendages of ascospores from herbarium material of this species on *Phragmites* apparently do not swell and elongate in water in the same way as those from living material (see, e.g., the drawings by Ingold 1955: 166). Baral (1992: 354-356) has demonstrated the striking morphological differences between gelatinous ascospore wall layers of freshly collected and rehydrated herbarium material. The somewhat radial structure of the apical portion of the ascoma wall reminds of *Lophiotrema* or *Lophiostoma* spp. and is very different from the one in *W. niesslii*, although the peridial structure may be subject to considerable modification due to the mechanical properties of the given substrate. The culms of *Phragmites* are much harder and tougher than the leaves of the larger *Carex* spp. The dark 'clypeus' of the species on *Phragmites* is superficially similar, but these ascomata bear numerous hyaline periphyses-like hyphae lining the ± elongate ostiolar opening. Together with the thinner and more numerous interascal filaments (apparently also pseudoparaphyses), the presence of these periphysis-like hyphae supports Shoemaker & Babcock's (1987: 391) view that the species on *Phragmites* belongs to the Lophiostomataceae, in spite of the absence of a protruding, laterally compressed ostiolar papilla. Eriksson & Yue (1986: 252), Eriksson & Hawksworth (1986: 142), and Barr (1987: 106) have only recently suggested to merge Massarinaceae (with ± rounded ostioles) and Lophiostomataceae (with laterally compressed ostioles). The species on *Phragmites* is apparently undescribed, but the ZT specimen is too scant and should not serve as type material. Fresh collections are desirable for the description of a new species. Contrary to Müller's (1950: 204) illustration, both *Wettsteinina niesslii* s.str. on *Carex* and the species on *Phragmites* have interascal filaments, most probably pseudoparaphyses.

Barr (1961: 308) reported two collections of *Wettsteinina niesslii* from Canada; one of them, on ***Carex rostrata*** Stokes, is *Wettsteinina candida* Shoemaker & Babcock (1987: 377); the other, on ***Eriophorum angustifolium*** Honck., 'deserves a new genus' (Shoemaker & Babcock 1987: 404), but has not so far been validly described. According to Barr (1961: 308, 1972: 544) it resembles *Monascostroma bacilliferum* (P. Karst.) O. E. Erikss. (apparently specific to *Scheuchzeria palustris* L.), but unfortunately her suggestions have not been discussed by Eriksson (1982: 196) or by Shoemaker & Babcock (1987: 377).

I want to thank Dr. Sergio Chiesa (Padova) for making the type material from the Saccardo collection in PAD available on loan, PD. Dr. Orlando Petrini (Zürich) and Prof. Dr. Ove Eriksson (Umeå) for acting as pre-submission reviewers, and Mag. Dr. Mario Matzer (Graz) for critically reading the revised manuscript.

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TULOSTOMA OPACUM Long IN NORTHERN AFRICA

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ABSTRACT - *Tulostoma opacum* from Northern Africa is described macro- and microscopically, and it is compared with Mexican material. This is the first extra-North American record of this species. Microphotographs of the spore ornamentation under the scanning electron microscope are included.

KEY WORDS: *Gasteromycetes*, *Tulostoma opacum,* Chorology, taxonomy

INTRODUCTION

During the taxonomical review of the genus *Tulostoma* in the Mediterranean basin that we are carrying out, we have observed that in this geographical region there are quite favourable environmental conditions for the growth and fructification of *Gasteromycetes*. Even more, there are some very interesting areas in the mentioned region that still keep mycological novelties, due to the low number of the explorations carried out there, the scarce mycologists studying them, and the inherent difficulties of the physical medium. This is the case of the Northwestern Africa, an especially important area for us on account of its relation with the Iberian Peninsula. Lately we have described the new species *Tulostoma scrupososporum* from Morocco (Altés *et.al.*, 1994). This time we report the presence of *Tulostoma opacum* Long in the same country, a species that only has been recorded till now in Southern United States and Northern Mexico (Wright, 1987).

MATERIAL AND METHODS

The material studied is deposited in the Herbarium of the University of Vienna, Austria (WU) and in the Herbarium of the Muséum National d'Histoire Naturelle, Paris, France (PC).

The methods used in this study are those indicated in a previous paper (Altés *et al.*, 1994).

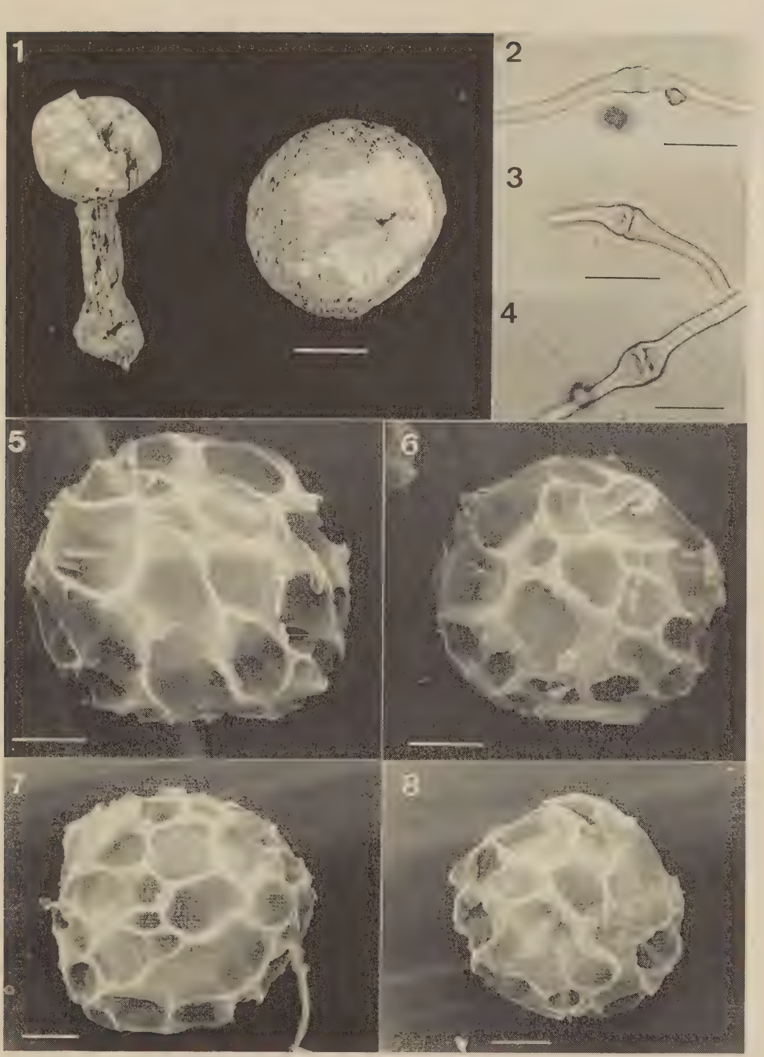
Tulostoma opacum Long, Mycologia 36:327-329, fig. 3. 1944.
(FIGS. 1-8)

Spore-sac subglobose-depressed, 8-9 mm high and 9-14 mm wide. *Mouth* fibrillose. *Exoperidium* clearly membranous, quite persistent, reddish brown outside and white inside. *Endoperidium* dirty white to cream color, covered in large measure with remains of the exoperidium. *Stem* 12-40 x 2-3 mm, more or less cylindrical, longitudinally striated, reddish brown, broadened at the base (4-5 mm diam). *Gleba* ferrugineous ochre.

Exoperidium consisting of hyphae 2.5-6 µm diam, usually collapsed, interwoven, walls thin, branched, frequently septate, not broadened at the septa, hyaline, no clamps seen. *Endoperidium* consisting of hyphae 3-6 µm diam, thick walls leaving a regular lumen, branched, septate, subhyaline, broadened at the slightly colored septa (up to 10 µm diam). *Spores* globose, pale yellow, 8-10 µm diam including the spore ornamentation, which is clearly reticulated, prolonging 1-1.5 µm from the spore body; under SEM a wide and deep reticulum, and some small folds and warts at the bottom, can be observed. *Capillitium* 3-6 µm diam, walls thick, branched, subhyaline, slightly broadened (sometimes up to 8.5 µm diam) at the uncolored or slightly colored septa.

STUDIED MATERIAL. AFRICA: MOROCCO: Taroudant, Azour, Tifnout, near *Tulostoma scruposospórum*, 6.XII.1989, A.Hausknecht, WU 12683. MEXICO: NUEVO LEON: road to Churubusco, to the east of Monterrey, 24.III.1967, H.Nieto, PC.

REMARKS. *Tulostoma opacum* can be easily distinguished from other species, also showing reticulate spores, according to the combination of some characters such as the membranous exoperidium, the fibrillose mouth and the big spores. However, *Tulostoma opacum* has been recorded only



FIGS. 1-8. *Tulostoma opacum*. 1. Fruit-bodies showing the membranous exoperidium, WU 12683. 2-4. Light micrographs of capillitium septa, WU 12683. 5, 6. SEM micrographs of the spore ornamentation, WU 12683. 7, 8. Spores of the Mexican material, PC.

three times till now, the type from New Mexico and a fruit-body from Texas, United States (Long, 1944) and a third collection from Nuevo León, Mexico (Wright *et al.*, 1972). This fourth record based on African material means a notable enlargement of its area of distribution and brings out the posibility of its presence in other adjacent regions such as Southern Europe.

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TWO NEW GENERA AND SOME NEW COMBINATIONS OF CORTICIOID FUNGI (BASIDIOMYCOTINA, APHYLLOPHORALES) FROM TROPICAL AND SUBTROPICAL AREAS

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SUMMARY

In preparation of a check-list for tropical and subtropical corticioid fungi, a number of taxa need descriptions, comments and formal combinations. Furthermore, two new genera are proposed viz.: *Cericium* (generic type: *Amethicium luteoincrustatum* Hjortstam & Ryvarden) and *Ripexicium* (generic type: *Trechispora spinulifera* Jülich).

BASIDIORADULUM TUBERCULATUM (Berk. & M. A. Curtis) Hjortstam nov. comb.
Basionym: *Grandinia tuberculata* Berk. & M. A. Curtis in Hooker's Lond. Journ. Bot. 1:237 (1849).
Holotype: USA, South Carolina, on Carya, M. A. Curtis 1111 (K).
Synonyms: *Phlebia albida* Post in Fr. Monogr. Hym. Suec. 2:280 (1863); *Radulum pallidum* Berk. & M. A. Curtis in Grevillea 1:145 (1873); *Stereum album* Quél. in Ass. Fr. Avance. Sci. 11:15 (1882); *Stereum subcostatum* P. Karst. in Hedwigia 20:178 (1881).

Microscopically there are small differences between this species and *Basidioradulum radula* (Fr.:Fr.) Nobles. The latter has cystidia, though often very few, but otherwise they have nearly the same kind of hyphae and basidia. The spores are, however, of diagnostic importance and are shorter, often 6-8 µm long in *B. tuberculatum*.
It should be noted that *Corticium colliculosum* Berk. & M. A. Curtis (see Hjortstam 1989) is somewhat intermediate between *Basidioradulum radula* and *B. tuberculatum* as to spore size (8-10 x 3-3.5 µm, in *B. radula* 9-11 x 3-3.5 µm).

BYSSOMERULIUS FLAVIDOALBUS (Corner) Hjortstam nov. comb.
Basionym: *Merulius purpurascens* var. *flavidoalbus* Corner in Gdns' Bull., Singapore 25:370 (1971).
Holotype: Malaya, Pahang, 1930, Corner (K).
Synonym: *Ceraceomerulius albostramineus* var. *flavidoalbus* (Corner) Ginns in Can. Journ. Bot. 54:117 (1976).

This species is reminiscent of *Byssomerulius albostramineus* (Torrend) Hjortstam, but differs primarily by shorter and ellipsoid to narrowly ellipsoid spores measuring 3.5-4.5 x 2-2.5 µm (in *B. albostramineus* allantoid 4.5-6 x 1.5-2 µm). The species is so far known only from the type locality.

BYSSOMERULIUS SORDIDUS (Berk. & M. A. Curtis ex Cooke) Hjortstam nov. comb.
Basionym: *Merulius sordidus* Berk. & M. A. Curtis ex Cooke in Grevillea 19:108 (1891).
Holotype: Venezuela, Fendler No.143 (K).

Additional specimens: Brazil, Sao Paulo, Campinas, Moji-Guaçu, 29-30 Jan. 1987, Hjortstam No.16714 (K); Sao Paulo, Pqe Estados das Fontes do Ipiranga, on palm, Ryvarden No.24630 (K); Rio de Janeiro, Itatiaia National Park, 23 Feb. 1956, O. Fidalgo (SP).

BASIDIOME resupinate, membranous and somewhat horny, with a reflexed margin, 2-10 mm broad.
HYMENOPHORE irregularly plicate to subporoid, golden brown; subiculum whitish.
HYPHAL SYSTEM monomitic; basal hyphae thick-walled, hyaline to pale yellowish, 5-6(-8) µm wide, straight and rather uniform, encrusted; other hyphae thin-walled, interwoven, 3-4 µm wide; all hyphae without clamp-connexions.
CYSTIDIA absent.
BASIDIA narrowly clavate, 20-25(-30) x 4-5 µm, with four sterigmata.
SPORES ellipsoid, smooth, thin-walled, 4-5.5 x 2.5-3 µm.

This species is closely related to *Byssocorticium corium* (Fr.) Parmasto, but is separated by shorter and ellipsoid spores without sigmoid appearance and by a golden brown hymenophore. Most specimens of *B. corium* are pale yellowish to pale orange and with spores narrowly ellipsoid, somewhat sigmoid, and 5.5-6(-7) µm long. According to Reid (1965) both *Cladoderris platensis* Speg. and *C. rickii* Lloyd are the same and probably also *Merulius mölleri* Bres. & Henn. Compare also Ginns (1976) who synonymized the latter species and *Merulius sordidus* with *B. corium.*

CERICIUM Hjortstam nov. gen.

Basidioma resupinatum, tenue vel crassiusculum, circiter 0.2-1 mm crassum, aliquantum stratosum, cereum. Hymenophorum leve vel tuberculatum. Systema hyphale dimiticum; subiculo distincto, albo vel pallide ochraceo, hyphis ramosissimis, perangustis, hyalinis, fibulis nullis. Hyphae cetero tenuitunicatae, hyalinae vel luteolae incrustatae, fibulatae. Cystidia conspicua, tenuitunicata, basaliter valde luteola incrustata, circiter 70-100 µm longa. Basidia subclavata, tenuitunicata, generaliter 35 µm longa, 4 sterigmatibus. Sporae leves, tenuitunicatae, in typo ad modum 5 x 3 µm, inamyloideae, indextrinoideae, acyanophilae.

Typus generis: *Amethicium luteoincrustatum* Hjortstam & Ryvarden

BASIDIOME resupinate, about 0.2-1 mm thick, somewhat stratified with two or more zones above the subiculum, fairly brittle and ceraceous.
HYMENOPHORE smooth or slightly tuberculate, pale coloured or ochraceous.

HYPHAL SYSTEM dimitic; subicular hyphae arboriform (binding-type hyphae), hyaline, without clamp-connexions. Other hyphae thin-walled, with clamp-connexions, hyaline to yellowish.
CYSTIDIA thin-walled, basally strongly encrusted with yellowish, resinous matter, usually 70-100 μm long.
BASIDIA subclavate in a rather dense layer, approximately 35 μm long, with four sterigmata and a basal clamp-connexion.
SPORES ellipsoid, smooth, thin-walled, in the type about 5 x 3 μm, inamyloid, indextrinoid, acyanophilous.

The genus is characterized by binding-type hyphae and numerous cystidia with yellowish incrustations. The genus *Amethicium* is superficially similar, but is notably distinct in its striking violet colour and lack of cystidia.

CERICIUM LUTEOINCRUSTATUM (Hjortstam & Ryvarden) Hjortstam nov. comb.
Basionym: *Amethicium luteoincrustatum* Hjortstam & Ryvarden in Mycotaxon 25:542 (1986).

CRUSTOMYCES STRATOSUS (Burds. & Nakasone) Hjortstam nov. comb.
Basionym: *Hypochnicium stratosum* Burds. & Nakasone in Mycotaxon 17:261 (1983).
Holotype: USA, Florida, on *Fagus*, 1977, HHB 9736 (CFMR).

This is a typical species of *Crustomyces* Jülich and seems to be most closely related to *C. pini-canadensis* (Schwein.) Jülich, *C. indecorus* Hjortstam and *C. subabruptus* (Bourdot & Galzin) Jülich. It differs from the first species by smaller and slightly thick-walled spores and the two latter are tuberculate to odontioid, whereas *C. stratosus* is completely smooth, though somewhat rimose.
One important character for *Crustomyces* is the dendrohyphidia which not were mentioned in the original description of *Hypochnicium stratosum*. The dendrohyphidia are, however, rather few in the species, but can as a rule be detected in a crushpreparation if Cottonblue is used.

CYLINDROBASIDIUM COPROSMAE (G. Cunn.) Hjortstam nov. comb.
Basionym: *Corticium coprosmae* G. Cunn. in Trans. Roy. Soc. N. Z. 82:280 (1954).
Isotype: New Zealand, Auckland, 1946, J. M. Dingley, PDD 4528 (K).

This species is closely related to *Cylindrobasidium albulum* (G. F.Atk. & Burt) J. Erikss. & Hjortstam and *C. torrendii* (Bres.) Hjortstam, preferably by its morphology of spores and cystidia. The former are typically pip-shaped and often in pairs or 3-4. *C.coprosmae* seems to be rather well separated from both, above all by a very dense hyphal texture and basidial layer. There is a good original description and Cunningham also pointed out the similarity with *Corticium evolvens* Fr.:Fr. [=*Cylindrobasidium evolvens* (Fr.:Fr.) Jülich].
It should be noted that Stalpers (1985) transferred *C. coprosmae* to *Chondrostereum* Pouzar. The latter is a pileate (or sometimes resupinate) genus with differently shaped spores and is reminiscent of *Phlebia* Fr. (see Eriksson and Ryvarden 1973). Chamuris (1988) did not accept *C. coprosmae* in *Chondrostereum*.

DENDROTHELE CANARIENSIS (Manjón & Moreno) Hjortstam nov. comb.
Basionym: *Cerocorticium canariense* Manjón & Moreno in Bot. Macaron. 10:29 (1982).

Holotype: Las Palmas, 21 Feb., on *Phoenix*, 1979, No.5053 (Univ. Alcalá Henares).
Synonym: *Epithele canariensis* (Manjón & Moreno) Hjortstam et al. in Mycotaxon 33:257 (1988).

BASIDIOME resupinate, closely adnate, thin.
HYMENOPHORE odontioid, whitish, with numerous, more or less semiglobose hyphal pegs, less than 0.5 mm high and 5-7/mm.
HYPHAL SYSTEM monomitic; hyphae thin-walled, encrusted, 2-3 µm wide, with clamp-connexions; aculeal hyphae sinuous, somewhat intertwined, thin-walled, 2-3 µm wide, apically often branching off to dendrohyphidia.
CYSTIDIA absent.
BASIDIA subclavate, subpedunculate, rarely lateral, 20-35(-40-45) x 5-7 µm, apically sometimes encrusted, with four, rather large and curved sterigmata measuring 8-10 µm in lenght, with a basal clamp-connexion.
SPORES subglobose, smooth, thin or slightly thick-walled (KOH), hyaline, generally 7 x 8 µm in diam. and with a distinct apiculus, inamyloid, indextrinoid and acyanophilous.

The species is reminiscent of *Dendrothele griseo-cana* (Bres.) Bourdot & Galzin by its morphology of basidia, dendrohyphidia and spores. The latter are, however, slightly smaller and less thick-walled in KOH.

GLOEOPORUS PURPURASCENS (Corner) Hjortstam nov. comb.
Basionym: *Merulius purpurascens* Corner in Gdns' Bull., Singapore 25:370 (1971).
Holotype: Malaya, Pahang, Fraser's Hill, 1930, Corner (K).

This species appears closely related to *Gloeoporus taxicola* (Pers.:Fr.) Gilb. & Ryvarden and has the same kind of small protruding cystidia (cystidioles) between the basidia. It is, however, separated by almost ellipsoid spores, 4(-5) x 1.5(-2) µm (in *G. taxicola* they are allantoid 4.5-6 x 1-1.5 µm).
Ginns (1976) synonymized *Merulius purpurascens* with *Byssomerulius albostramineus* (Torrend) Ginns. The latter has well differentiated clavate cystidia and slightly larger, allantoid spores.

GYRODONTIUM SACCHARI (Spreng.:Fr.) Hjortstam nov. comb.
Basionym: *Hydnum sacchari* Spreng.:Fr. Syst. Mycol. I:416 (1821).
Holotype: *In foliis Sacchari officinarum, Guadeloupae*, Sprengel (UPS).
Synonyms: *Hydnum boveanum* Mont.in Decaisne in Ann. Sci.nat. Bot. Ser. II, 4:194 (1835); *Gyrodontium bovenaum* (Mont.in Decaisne) Maas Geest. in Persoonia 3:157 (1964); *Gyrodontium capense* D.A. Reid, in Kew Bull. 17:269 (1963); *Hydnum clavarioides* Berk. & M. A. Curtis in Journ. Linn. Soc. Bot.10:325 (1868); *Hydnum flavidum* Lloyd in Mycol. Notes No.83:957 (1920); *Hydnum henningsii* Bres.in Bull. Soc. mycol. Fr. 6:19 (1890), generic type of *Gyrodontium*; *Gyrodontium henningsii* (Bres.) Pat. in Essai taxon. Hym. p.117 (1900); *Hydnum merulioides* Berk. & Broome in Trans. Linn. Soc. Lond. (Bot.) Ser. II, 2:62 (1883); *Boninohydnum pini* Ito & Imai in Trans. Sapporo nat. Hist. Soc. 6:127 (1940); *Hydnum serpuloides* Henn. in Verh. bot. Ver. Brandenb. 40:1122 (1898); *Gyrodontium serpuloides* (Henn.) D.A.Reid in Kew Bull.17:267 (1963); *Hydnum versicolor* Berk. & Broome in Journ. Linn. Soc. Bot. 14:59 (1873); *Gyrodontium versicolor* (Berk. & Broome) Maas Geest. in Persoonia 3:190 (1964).
The following description is based on a specimen from Brazil, Hjm No.16481 (K).

BASIDIOME easily separable from the substratum, resupinate to subpileate, (often extremely variable in size).
HYMENOPHORE at first tuberculate to more or less subporoid, then aculeate to distinctly hydnoid; aculei flattened to more rarely conical, 5-7(-10) mm long, olive-green to mostly sulphure-coloured or reddish-brown.
HYPHAL SYSTEM monomitic; generative hyphae 2-5 µm wide, hyaline to subhyaline, thin-walled; other hyphae 4-8 µm wide, thick-walled and with a slight cyanophilous reaction; aculeal hyphae mostly parallel arranged and forming a rather dense trama. All hyphae without clamp-connexions:
CYSTIDIA absent.
BASIDIA subclavate, thin-walled, 13-16 x 5(-6-7) µm, with four sterigmata and without a basal clamp-connexion.
SPORES elliptical, thick-walled, yellowish-brown, 4-5(-6) x 2.25- 2.75(-3.5) µm, with a weak or, after 1-5 minutes, a rather strong dextrinoid reaction, distinctly cyanophilous.

HYPHODONTIA AUSTRALIS (Berk.) Hjortstam nov. comb.
Basionym: *Grandinia australis* Berk. in Hooker's Bot. Antarct. Voy. Fl. Tasm. 2:257 (1859).
Holotype: Tasmania, on dead wood, Archer (K).
Additional specimens: Australia, Tasmania, Cleland No.1828; Queensland, Cooke; Victoria, Martin Nos.867 and 1111, Sinnott No.2408, Mrs. Healy No.6005; Sidney, Cheesman 1914 (all K).

BASIDIOME resupinate, at first loosely adnate and rather membranous.
HYMENOPHORE crustaceous and as a rule distinctly cracked into small polygones, grandinioid to hydnoid with the aculei often slightly fimbriate at the apex, 5-6/mm, when young pale brown with an olive tint, then sordidly buff, violet in KOH.
SUBICULUM at first dull brown or even sulphuric, then more or less white.
HYPHAL SYSTEM monomitic; hyphae thin-walled or slightly thick-walled; subicular hyphae densely interwoven, 3.5-5 µm wide; all hyphae with clamp-connexions.
CYSTIDIA scattered to numerous, 40-60 µm long and projecting above the basidia as much as 10-20 µm, thin-walled, apically more or less subulate, sometimes sinuous or moniliform.
BASIDIA narrowly clavate, waisted, 20-30 x 4-5 µm, with four sterigmata and a basal clamp-connexion, apparently without internal repetition.
SPORES ellipsoid, hyaline, smooth, thin-walled, (5.5-)6-7.5 x (3.5-)4-4.5 µm, inamyloid, indextrinoid and acyanophilous.

This species is recognized by its grandinioid to odontioid basidiome, a violet reaction with KOH and projecting cystidia. *H. australis* is somewhat reminiscent of *H. crustosa* (see Eriksson and Ryvarden, 1976), but differs by ellipsoid spores and basidial repetition has not been observed.

HYPOCHNICIUM LYNDONIAE (D. A. Reid) Hjortstam nov. comb.
Basionym: *Odontia lyndoniae* D. A. Reid in Kew Bull. 1955:641 (1956).
Holotype: Australia, Victoria, on *Salix*, Mrs E. Lyndon, F. P. S. M. No.3458 (K).
Synonym: *Nodotia aspera* Hjortstam in Mycotaxon 28:33-34 (1987)
Hypochnicium gomezii Lopez & Wright is extremely similar, but can readily be separated by occurrence of skeletocystidia and slightly larger spores measuring 7.5-8 x 6.5-

7.5 µm (in *H. gomezii* 7-7.5 µm in diam.). *Nodotia* Hjortstam (loc. cit), which was described to accommodate *N.aspera,* i a superfluous name and is considered to be a synonym of *Hypochnicium* J. Erikss.

INTEXTOMYCES AUREUS (Ryvarden) Hjortstam nov. comb.
Basionym: *Hypochnicium aureum* Ryvarden in Bull. Jard. Bot. Nat. Belg. 48:90 (1978).
Holotype: Africa, Rwanda, Rammeloo No.4491 (GENT).

Intextomyces aureus is very similar to *I. contiguus* (P. Karst.) J. Erikss. & Ryvarden and differs mainly by its yellow colour.

LOPHARIA AYRESII (Berk. ex Cooke) Hjortstam nov. comb.
Basionym: *Peniophora ayresii* Berk. ex Cooke in Grevillea 8:21 (1879).
Holotype: *ad truncus in insula Mauritii* (K).
Synonyms: *Hyphoderma ayresii* (Berk. ex Cooke) Boidin & Gilles in Cryptog. Mycol. 12:103 (1991); *Hyphoderma macrosporum* Sheng H. Wu in Acta bot. fennica 142:69 (1990).

Undoubtedly the species is closely related to *Lopharia cinerascens* (Schwein.) G. Cunn., but is readily separated by a monomitic hyphal system and subglobose to broadly ellipsoid spores.

LOPHARIA RUGULOSA (Berk. & M. A. Curtis) Hjortstam nov. comb.
Basionym: *Merulius rugulosus* Berk. & M. A. Curtis in Journ. Linn. Soc. Bot. 10:323 (1868).
Holotype: Cuba, on a rotten erect stick, No.245 (K).

For a description see Ginns (1971) and compare also Hjortstam (1990).

MYCOACIA COLUMELLIFERA (G. Cunn.) Hjortstam nov. comb.
Basionym: *Odontia columellifera* G. Cunn. in Trans. Roy. Soc. N. Z. 86:84 (1959).
Holotype: New Zealand, Auckland, 1954, on *Leptospermum,* PDD 18099.
Synonym: *Columnodontia columellifera* (G. Cunn.) Jülich in Persoonia 10:327 (1979).

The species is similar to *Mycoacia fuscoatra* (Fr.:Fr.) Donk, but differs by columns of crystals in the middle part of the aculei and by ellipsoid spores.

MYCOACIA LUTEA (G. Cunn.) Hjortstam nov. comb.
Basionym: *Odontia lutea* G. Cunn. in Trans. Roy. Soc. N. Z. 86:82-83 (1959).
Holotype: New Zealand, Auckland, 1954, on *Dysoxylum*, PDD 17925.

The spores are similar to those of *Mycoacia uda* (Fr.) Donk, but otherwise well distinguished by larger cystidia.

MYCOACIA SUBFASCICULARIA (Wakefield) Hjortstam nov. comb.
Basionym: *Acia subfascicularia* Wakefield in Trans. Proc. R. Soc. Austr. 54:155 (1930).
Holotype: Australia, J. B. Cleland, 1928 (K).
Synonym: *Columnodontia subfascicularia* (Wakefield) Jülich in Persoonia 10:327 (1979).

The micromorphology of this species is exactly the same as in the concept of *Mycoacia* Donk and is similar to *M. fuscoatra* (Fr.:Fr.) Donk. However, the spores are decidedly smaller, approximately 4-4.5 x 1.8-2 µm (in *M. fuscoatra* 5-6 x 2-2.5 µm) and cystidia are presumably absent.

PHANEROCHAETE FLAVOCARNEA (Petch) Hjortstam nov. comb.
Basionym: *Corticium flavocarneum* Petch in Ann. Roy. Bot. Gard., Peradeniya 9:288-289 (1925).
Holotype: Sri Lanka, Habgallae on wood, 1915, No.4672 (K).

This is a typical species of *Phanerochaete* P. Karst. and is extremely similar to *Phanerochaete australis* Jülich, but the hymenophore has a reddish shade, instead of pure white or pale ochraceous in the latter. The spores are also slightly larger, 5-6 x 2.75-3 µm (in *P. australis* 4-5.5 x 2-2.5 µm).

PHANEROCHAETE LUTEA (Sheng H. Wu) Hjortstam nov. comb.
Basionym: *Efibula lutea* Sheng H. Wu in Acta fenn. bot. 142:23 (1990).
Holotype: Taiwan, on angiosperm, Wu No.880417-5 (H).

This is a non-cystidiate species of *Phanerochaete* and is very distinctive due to the yellow colour and relatively small, narrowly ellipsoid spores measuring 5 x 2.5(-2.8) µm. The genus *Efibula* Sheng H. Wu (loc.cit.) is considered as a synonym of *Phanerochaete* P. Karst.

PHANEROCHAETE TROPICA (Sheng H. Wu) Hjortstam nov. comb.
Basionym: *Efibula tropica* Sheng H. Wu in Acta bot. fenn. 142:25 (1990).
Holotype: Taiwan, on *Ficus*, Wu No.871203 (TAI).

This is also a non-cystidiate species of *Phanerochaete* and seems to be closely related to *Phanerochaete avellanea* (Bourdot & Galzin) J. Erikss.& Hjortstam.

PHANEROCHAETE TUMULOSA (P.H.B. Talbot) Hjortstam nov. comb.
Basionym: *Corticium tumulosum* P. H. B. Talbot in Bothalia 4:941 (1948).
Holotype: South Africa, Pretoria, 1937, K. A. Landsdell No.28897 (K).

BASIDIOME resupinate, closely adnate, rather hard.
HYMENOPHORE smooth or slightly tuberculate, more or less cracking, pale reddish brown.
HYPHAL SYSTEM monomitic; hyphae thin-walled, hyaline, smooth, 3-5 µm wide, without or with occasional clamp-connexions.
CYSTIDIA absent.
BASIDIA clavate, 25-30(-40) x 4.5-5.5 µm, with four sterigmata.
SPORES broadly ellipsoid, 4.5-6 x 3.5-4 µm.

Corticium tumulosum was considered as a synonym of *Phanerochaete aurata* (Bourdot & Galzin) Burds. (Burdsall 1985), but the latter species has, according to both Burdsall and Bourdot and Galzin (1928), considerably larger spores measuring 7-8 x 5-6 µm (Bourdot and Galzin), 7.5-9 x 4.5-5.5(-6) µm (Burdsall).
According to Talbot (1951) very much like *Corticium cacaoicolor* Petch, but this species has apparently clamp-connexions throughout and seems to fit in *Phlebia* s.l.

PHLEBIA FIBULIGERA (K. S. Thind & S. S. Rattan) Hjortstam nov. comb.
Basionym: *Peniophora fibuligera* K. S. Thind & S. S. Rattan in Mycologia 65:1253 (1973).
Isotype: India, Himachal Pradesh, *in ligno Cedri deodarae*, 1967, Rattan No.5341 (K).

This species appears to be similar to *Phlebia cornea* (Bourdot & Galzin) J. Erikss. but has smaller, more or less subglobose spores measuring 4-6 x 2-4 µm.

PHLEBIA INTROVERSA (Rehill & B.K. Bakshi) Hjortstam nov. comb.
Basionym: *Corticium introversum* Rehill & B.K. Bakshi in Indian Forest Bull. 242: 12-13 (1965).
Isotype: India, Mundali, 1957, No.7211 (K).

Apparently without cystidia, but in other characteristics the species is reminiscent of *Phlebia cornea* (Bourdot & Galzin) J. Erikss. It should be noted that Rattan (1977) reported this species (as a synonym of *Phlebia albida* Post in Fr.) as relatively common in India.

PHLEBIA LIVIDINA Hjortstam nov. nom.
Basionym: *Hydnum (Resupinatum) fascicularia* Berk. & M. A. Curtis in Grevillea 1:99 (1873); non *Hydnum fasciculare* Alb.& Schwein.:Fr. Syst. Mycol. 1:418 (1821).
Holotype: USA, South Carolina, Peters 4725 (K).

According to Gilbertson (1965) the same as *Mycoacia stenodon* (Pers.) Donk [= *Mycoacia aurea* (Fr.) J. Erikss. & Ryvarden], but seems rather to be similar to *Phlebia livida* (Pers.:Fr.) Bres. and differs mainly by a more distinct tuberculate to odontioid basidiome. Cystidia have not been observed, but in other microscopical characters, the two species are inseparable.

PHLEBIELLA CINNAMOMEA (Burds. & Nakasone) Hjortstam nov. comb.
Basionym: *Lazulinospora cinnamomea* Burds. & Nakasone in Mycologia 73:464 (1981).
Holotype: USA, Florida, on *Magnolia* sp., HHB 9511 (CFMR).

This is a typical species of *Phlebiella* P. Karst. and is reminiscent of *P.vaga* (Fr.) P. Karst., but differs mainly by smaller spores.

POROSTEREUM FUSCOMARGINATUM (Burt) Hjortstam comb.nov
Basionym: *Peniophora fuscomarginata* Burt in Ann.Mo.Bot.Gard. 12:335 (1926).
Holotype: USA. Louisiana, St.Martinville, 15 July 1897, A.B. Langlois No.100 (FH).

The species is reminiscent of *Porostereum nova-granatum* (Welden) Hjortstam & Ryvarden, but has slightly larger spores measuring (6.5-)7.5-9 x (3-)4.5-5 μm (in *P. nova-granatum* 5.5-7 x 3-5 μm).

PSEUDOLAGAROBASIDIUM CONCENTRICUM (Cooke & Ellis) Hjortstam nov. comb.
Basionym: *Radulum concentricum* Cooke & Ellis in Grevillea 14:13 (1885).
Synonyms: *Phlebia concentrica* (Cooke & Ellis) Kropp & Nakasone in Mycotaxon 24:424 (1985); *Pirex concentricus* (Cooke & Ellis) Hjortstam & Ryvarden in Mycotaxon 24:289 (1985); *Irpex owensii* Lloyd in Mycol. Writ. 5:616 (1916).

The genus *Pirex* Hjortstam & Ryvarden is considered as a synonym of *Pseudolagarobasidium* J.C. Jang & T. Chen. See further Wu (1990).

PUNCTULARIA SUBHEPATICA (Berk.) Hjortstam nov. comb.
Basionym: *Thelephora subhepatica* Berk. in Lond. Journ. Bot. 5:2 (1846).
Holotype: Peru, Casapi, on dead bark, Mathews (K).
Synonyms: *Thelephora atropurpurascens* Berk.& Broome in Journ. Linn. Soc. Bot. 14:64 (1873). For further synonyms, see Talbot (1951 and 1958).

RIPEXICIUM Hjortstam nov. gen.
Genus haec ab Mycoacia differt sporis verrucosis et basidiis laxe dispositis.
Typus generis: *Trechispora spinulifera* Jülich

BASIDIOME resupinate, effused, closely adnate.
HYMENOPHORE hyd-noid, aculei conical, smooth, when dried horny.
SUBICULUM thin, about 0.25 mm thick, whitish.
HYPHAL SYSTEM monomitic; generative hyphae rather straight, hyaline to pale yellowish brown, with clamp-connexions.
CYSTIDIA absent.
BASIDIA thin-walled throughout, short, 15-20 µm long, more or less clavate, as a rule broadest in the middle part, rarely pedunculate, loosely arranged, with four sterigmata and a basal clamp-connexion.
SPORES small, hyaline, verrucose, with a distinct but rather minute apiculus, inamyloid, indextrinoid, with a slight cyanophilous reaction.

This genus appears similar to *Mycoacia* Donk by its strongly odontioid hymenophore with horny aculei. However, in microscopic details it is immediately separated by verrucose spores and by the basidial layer which is rather loose and not arranged in a typical palisade as in *Mycoacia.*

RIPEXICIUM SPINULIFERUM (Jülich) Hjortstam nov. comb.
Basionym: *Trechispora spinulifera* Jülich in Persoonia 8:437-438 (1976).
Holotype: Solomon Islands, Malaita Island, Dala Cocoa Res. St., G.W.Jackson 1975, D5 (L).
In the original description the species was reported as saprophytic on termite nests.

BASIDIOME resupinate, effused.
HYMENOPHORE distinctly hydnoid with smooth, conical and crowded aculei, in the type 1-1.8 mm long and about 0.2 mm wide at the base, honey-coloured to pale brown.
HYPHAL SYSTEM monomitic; aculeal hyphae thin-walled or with a slight wall thickening, lying parallell or more commonly intertwoven in the centre of the aculei, individual hyphae straight and uniform, hyaline or, in the inner core, pale yellowish brown, about 3 µm wide and with clamp-connexions.
CYSTIDIA absent
BASIDIA short-clavate, rarely pedunculate, thin-walled, loosely arranged, 15-18(-20) x 4-5 µm, with four sterigmata and a basal clamp-connexion.
SPORES subglobose, with a slight wall thickening, about 3.5 x 3 µm, exclusive of the semiglobose verrucae which are 0.3-0.5 µm long, hyaline, inamyloid, indextrinoid but with a slight cyanophilous reaction.

This species is, at least superficially, similar to *Trechispora* P. Karst., but the hyphae lack typical ampullate septa and the basidiomes of species of *Trechispora* are soft and fragile, never horny.

SCYTINOSTROMA CRASSUM (S.S. Rattan) Hjortstam nov. comb.
Basionym: *Scytinostroma odoratum* (Fr.) Donk forma *crassum* S.S. Rattan in Trans. Br. mycol. Soc. 63:6 (1974).
Isotype: India, Himachal Pradesh, on stump of *Picea*, 1966, Rattan No.5156 (K).

Scytinostroma crassum is recognized by the relatively large spores measuring 9-10 x 5.5-6 µm and hyphae lacking clamp-connexions. The spores are, however, never amygdaliform but broadly ellipsoid and the species appears similar to *S. phaeosarcum* Boidin & Lanq.

SCYTINOSTROMELLA ARACHNOIDEA (Peck) Hjortstam nov. comb.
Basionym: *Hydnum arachnoideum* Peck in N. Y. St. Mus. Ann. Rep. 44: 133 (1891).
Holotype: USA (New York), Salamanca, C.H.Peck (FH).
Synonyms: *Scytinostroma arachnoideum* (Peck) Gilb. in Mycologia 54:660 (1962); *Corticium quaesitum* H. S. Jacks. & Dearden in Can. Journ. Res., C, 27:154 (1949).

A typical species of *Scytinostromella.* See further Hallenberg (1985).

VESICULOMYCES CORROSUS (G. Cunn.) Hjortstam nov. comb.
Basionym: *Corticium corrosum* G. Cunn. in Trans. Roy. Soc. N. Z. 82:286 (1954).
Isotype: New Zealand, Auckland, on *Nothopanax*, 1946, G.H. Cunningham, PDD 11350 (K).

This species lacks clamp-connexions and the spore morphology indicate a close relationship to *Vesiculomyces citrinus* (Pers.) Hagström. The gloeocystidia are positive in sulphovanillin, whereas in the latter species they are negative in both fresh and in dried specimens, but proved to be positive in culture.
When Stalpers (1985) studied taxa of *Corticium* described by Cunningham he placed this species in *Gloeocystidiellum* Donk, preferably by the amyloid spores. The spores are, however, not strongly amyloid but greyish in Melzer and with oily contents in KOH.

XENASMA UMBONATUM (G. Cunn.) Hjortstam nov. comb.
Basionym: *Corticium umbonatum* G. Cunn. in Trans Roy. Soc. N. Z. 82: 298 (1954)
Isotype: New Zealand, Auckland, on *Bambusa*, 1950, G.H. Cunningham, PDD 10596 (K).
Synonyms: *Cunninghammyces umbonatus* (G. Cunn.) Stalpers in N. Z. Jl Bot. 23:309 (1985); *Hypochnicium pleurobasidiatum* Boidin & al. in Trans. mycol. Soc. Japan 27:468 (1987).

Corticium umbonatum is a typical species of *Xenasma* by its lateral basidia and rugose spores and is known from different kinds of bamboo; *Arundinaria, Pseudosasa* and once on *Ripogonum* (Liliaceae). *Cunninghammyces* Stalpers is considered as a synonym of *Xenasma* Donk.

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MYCOTAXON

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AMANITA LONGITIBIALE—A NEW SPECIES OF AMANITA SECTION PHALLOIDEAE FROM CENTRAL MEXICO AND SOUTHEASTERN U.S.A.

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Summary

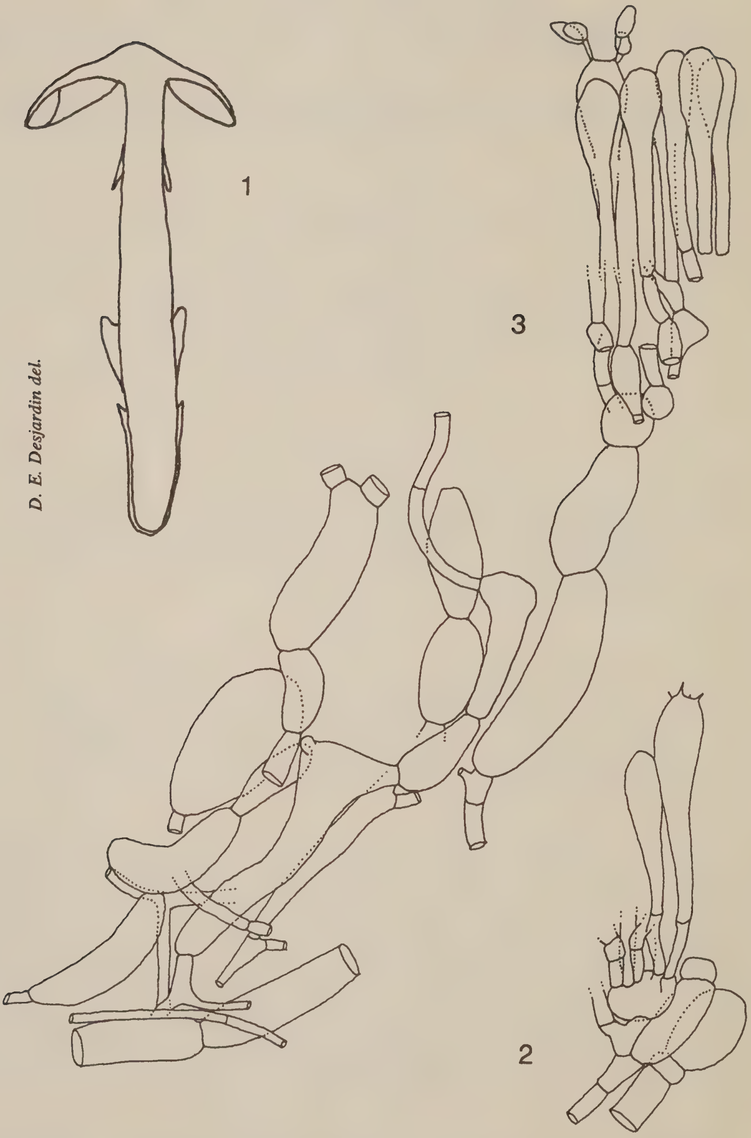
Amanita longitibiale is described as new from central Mexico and North Carolina, U.S.A. In *Amanita* section *Phalloideae*, it has the unique combination of cylindric spores, pigmented pileipellis, slender and radicating stipe bulb, and saccate volva.

Resumen

Amanita longitibiale se describe como especie nueva para el centro de México y North Carolina, E.U.A. En *Amanita* sección *Phalloideae*, presenta la combinación única de esporas cilíndricas, pileipellis pigmentado, estípite delgadamente bulboso y radicante, así como volva en forma de saco.

Methods and terminology follow those of Tulloss *et al.* (1992), Tulloss (1993), and Tulloss (1994). Color codes of the form "6D6" are from (Kornerup & Wanscher, 1978). With one exception (RET—Tulloss' personal herbarium), abbreviations of names of herbaria follow Holmgren *et al.* (1990). In carrying out the phenoloxidase spot tests for this species, we did not wash a longitudinal section of a specimen with reagent (*e.g.*, Marr, 1979; Marr *et al.*, 1986; Tulloss, 1993), but applied the reagent by single drops in restricted spots: pileus surface at about mid-radius, lamella surface near the free edge, interior tissue of volval limb, context of stipe in portion above bulb, context of bulb, surface of annulus. Spot tests reported for other reagents were applied in the same spots or a subset of them.

In the field, a specimen of *Amanita longitibiale* (Fig. 1) may have a rather squat appearance before it is excavated; however, buried in the substrate is a radicating stipe base. The grayish brown to umbrinous pileus of the present species makes it the only known member of *Amanita* section *Phalloideae* (Fr.) Quél. having the combination of colored pileus and cylindric to bacilliform spores. Its stipe is decorated with a



D. E. Desjardin del.

Figs. 1-3 *Amanita longitibiale*. 1. Habit (×0.75) of slender northern specimen from field sketch of D. E. Desjardin (Bixler *s.n.*). 2. Elements of hymenium and subhymenium (holotype). 3. Elements of hymenium, subhymenium and subhymenial base (MEXU 23831). All anatomical drawings are scaled 570:1.

flaring, apical to subapical annulus; its narrow bulb has a lobed to vertically lacerate, saccate volva.

Amanita longitibiale Tulloss, Pérez-Silva & Herrera *sp. nov.*

=*Amanita peckiana sensu* Herrera & Pérez-Silva. 1984. *Bol. Soc. Méx. Micol.* 19: 266-67, pl. 1-3.
non Amanita peckiana C. H. Kauffm. *in* Peck. 1913. *Mycologia* 5: 67.
Illus.: Pérez-Silva & Herrera S. 1991. *Iconogr. macromic. México. I Amanita*: 65, pl. XVIII; 113, fig. 38.

Etymology: *longus*, long + *tibiale*, stocking—because of this species' free volval limb and long radicating, slender bulb which together suggest a stocking pulled far up someone's leg.

Pileus 38 - 100 *mm latus, initio interdum subflavocremeus deinde subgriseobrunneus vel griseobrunneus vel umbrinus, initio irregulariter hemisphericus vel ovoideus deinde planoconvexus, margine subgrisea vel subflavogrisea (interdum virgata) non striata. Lamellae liberae vel quasi liberae, albae vel subroseae, confertae; lamellulis attenuatis et abundantibus. Stipes* 50 - 110 × 6 - 30 *mm (longitudinem bulbi includens) albus, bulbo gracili et radicato, carne alba et in bulbo interdum disperse subrosea, velo hymeniali albo membranaceo amplo persistenti apicali vel subapicali vel supero, volva saccata. Sporae* (10.0-) 10.5 - 12.8 (-14.8) × (4.2-) 5.0 - 6.5 (-7.2) *µm, amyloideae, elongatae vel cylindricae, raro bacilliformis. Basidia gracile. Fibulae infrequentes. Sporae cylindricae, pileipellis coloratus, stipes bulbo gracili et radicato, et volva saccata conjunctionem unicum in Amanita sectione Phalloideae formans. Holotypus*: MEXICO, Distrito Federal, km 20, carretera Jalatlaco-El Ajusco, 21.vii.1982 E. Aguírre & E. Chinchilla *s.n.* (MEXU 17384).

PILEUS: 38 - 100 mm wide, sometimes yellowish cream (about 4A3) at first, eventually pale grayish brown (5B3) to grayish brown to umbrinous with pale gray to slightly yellowish gray margin, marginal region sometimes virgate, unevenly hemispheric to ovoid at first, then plano-convex, often with low broad umbo, subviscid, shiny when dry; *context* white, rather thick in disk (thickness up to about one half of stipe diameter), narrowing evenly to margin; *margin* inflexed at first, later decurved, nonstriate, nonappendiculate; *universal veil* absent or as dispersed patches, pallid, detersile, with pale orangish brown or a pale and sordid orangish brown (5B4 or a little grayer than 5B4) tint.

LAMELLAE: free or attached by a line, with decurrent line on stipe apex, close, white, sometimes with a light pink tint, somewhat orangish tan (close to 5B5) in dried material, moderately broad to broad, with floccose and concolorous edge; *lamellulae* attenuate, plentiful, in several ranks.

STIPE: 50 - 110 (includes bulb) × 6 - 30 mm, white, narrowing slightly upward, pruinose above annulus, furfuraceous below; *bulb* occupying about one third to one half of stipe length, pointed below or radicating, usually rather slender, sometimes as only slight swelling of stipe before start of tapering to point; *context* white, sometimes with pink tones in bulb, firm, solid to stuffed becoming hollow; *partial veil* skirtlike and flaring at first, membranous, copious, persistent, white, thin, striate above, superior to subapical to apical; *universal veil* as limbate to saccate volva, adnate from broadest part of bulb downward or attached only for as little as bottom fifth of bulb length, forming hollow cylinder around stipe base, with free portion sometimes separated from bulb and slid short distance upward (Fig. 1), with margin lobed unevenly (sometimes very markedly so) or lacerate by presence of many short vertical slits in edge, membranous and tough (remaining so in exsiccata), white, with exterior becoming pale brownish to ochraceous, sometimes with tints of pink at base, with inner surface remaining pallid.

Odor farinaceous in Mexican material [very unusual for *Amanita* (C. Bas, priv. corresp.)] or not distinctive (Bixler *s.n.*). *Taste* mild.

MACROCHEMICAL TESTS: 95% methanol (control) - negative on pileus, on lamella, in volval limb interior, and in stipe context (including bulb). 10% KOH - on pileus, immediately orange to reddish orange (7A6); on lamella, negative; other spots not tested. Spot test for tyrosinase (L-tyrosine) - on pileus and lamella surface deep pink (12A6) spottily after 15 min., in volval limb interior pink (12A4) after 5 min., on annulus pinkish white (12A2) after 5 min.; other spots not tested. Spot test for tyrosinase (paracresol) - on pileus and lamella surface pinkish white (12A2) after 10 min.; in volval limb interior, negative; other spots not tested. Spot test for laccase (syringaldazine) - negative on pileus and lamella surface, in stipe context, and in volval limb interior; other spots not tested.

PILEIPELLIS: 10 - 15 μm thick, yellow-brown to orange-brown in 3% KOH; filamentous, undifferentiated hyphae 2.8 - 5.0 μm wide, interwoven, extensively gelatinizing, with subradial arrangement notable near disk; vascular hyphae 2.2 - 8.0 μm wide, branching, sinuous, common. PILEUS CONTEXT: filamentous, undifferentiated hyphae 1.8 - 15.0 μm wide, branching, mostly in fascicles, with those of largest diameter being slightly inflated; acrophysalides narrowly clavate to clavate to narrowly ellipsoid to pyriform, up to 103 × 50 μm, sometimes in chains, with walls thin or up to $0.5^{\pm}$ μm thick; vascular hyphae not observed. LAMELLA TRAMA: bilateral, broad, with w_{cs} = 50 - 90 μm in specimen dried with sporulation just beginning (MEXU 23831); with elements of subhymenial base (consisting of inflated cells narrowly clavate to clavate to ovoid, up to 61 × 25 μm, thin-walled) diverging from central stratum at very shallow angle and continuing in smooth broad curve until entering subhymenium at angle of 45 - 90 degrees to central stratum; filamentous, undifferentiated hyphae 1.5 - 9.0 μm wide, densely interwoven and often with constricted septa in central stratum, with some intercalary segments slightly inflated (up to 13.5 μm wide); divergent, terminal inflated cells not observed; vascular hyphae not observed; clamps scarce. SUBHYMENIUM: w_{st}-near = 80 - 120 μm in specimen dried with sporulation just beginning (MEXU 23831); w_{st}-far = 115- 140 μm in specimen dried with sporulation just beginning (MEXU 23831); intensely ramifying, comprising small cells (inflated to subinflated to uninflated, frequently irregular or branched) taking on any angle to central stratum (including parallel to it and often developing in direction opposite to that of trama divergence), with basidia arising multiply (from inflated elements) or singly from uninflated elements or small inflated elements. BASIDIA: 31 - 73 × 7.8 - 11.2 μm, thin-walled, dominantly 4-, occasionally 2-sterigmate; clamps present, but sparsely distributed. UNIVERSAL VEIL: *On stipe base, outer surface*: filamentous, undifferentiated hyphae 1.2 - 7.5 μm wide, in fascicles interwoven loosely without dominant orientation, occasionally with horizontal orientation. *On stipe base, interior*: filamentous, undifferentiated hyphae 2.0 - 7.0 μm wide, with strong longitudinal orientation, often in fascicles, branching, plentiful; inflated cells plentiful to dominant, narrowly clavate to clavate to broadly clavate to elongate-ellipsoid, thin-walled, up to 93 × 50^+ μm; vascular hyphae 2.0 - 6.0 μm wide, branching, most frequent near inner surface of limb. *On stipe base, inner surface*: like limb interior except for scattered fragments of fascicles of partially gelatinized, filamentous, undifferentiated hyphae. *On pileus, upper surface*: filamentous, undifferentiated hyphae 1.0 - 4.8 μm wide, partially gelatinizing, in fascicles having largely co-parallel orientation, but occasionally perpendicular to main group. *On pileus, interior and lower layers*: as on stipe base, with uncommon vascular hyphae as narrow as 2.8 μm wide. STIPE CONTEXT: longitudinally acrophysalidic; filamentous, undifferentiated hyphae 1.5 - 8.5 μm wide, with some of greatest diameter having walls 0.5 -1.0 μm thick; acrophysalides up to 268 × 36 μm, thin-walled, dominating; vascular hyphae 4.2 - 11.0 μm wide, branching; clamps scarce. PARTIAL VEIL: filamentous, undifferentiated hyphae 1.5 - 7.5 μm wide, very loosely interwoven, frequently branching, collapsing, with some (especially those of larger diameter) in radially oriented fascicles; inflated cells intercalary or terminal or in short terminal chains, clavate or as slightly inflated hyphal segments, up to 52 × 19.0 μm; vascular hyphae not observed; clamps not observed. All tissues hyaline and colorless unless otherwise stated.

BASIDIOSPORES: [120/5/5] (10.0-) 10.5 - 12.8 (-14.8) × (4.2-) 5.0 - 6.5 (-7.2) μm, (**L** = 11.4 - 12.3 μm; **L'** = 11.7 μm; **W** = 5.4 - 5.8 μm; **W'** = 5.6 μm; Q = (1.56-) 1.75 - 2.40 (-3.05); **Q** = 2.0 - 2.28; **Q'** = 2.09), hyaline, colorless, thin-walled, smooth, amyloid, elongate to cylindric, rarely bacilliform, occasionally expanded at one end, commonly constricted; apiculus sublateral, occasionally subapical, small, cylindric; contents monoguttulate; white in deposit.

Distribution and habitat: Solitary, July to September. Mexico: in forest of *Pinus spp.* or in forest of *Abies religiosa* Mart. and *Pinus*. North Carolina, U.S.A.: in sandy clay soil in mixed hardwood forest.

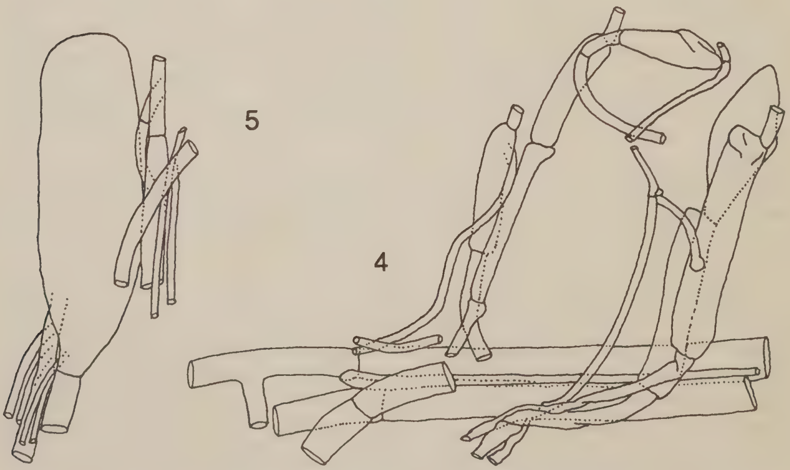
Collections examined: **MÉXICO:** DISTRITO FEDERAL—km 20, carretera Ajusco-Jalatlaco, 25.vii.1980 E. Pérez-Silva & E. Chinchilla *s.n.* (MEXU 16140 as "*A. peckiana*"); km 20, carretera Jalatlaco-El Ajusco, 21.vii.1982 E. Aguírre & E. Chinchilla *s.n.* (holotype, MEXU 17384 as "*A. peckiana*"). ESTADO de MÉXICO—km 25, carretera Ajusco-Jalatlaco, 10.ix.1993, E. Pérez-Silva & T. Herrera *s.n.* (MEXU 23831; RET); Llano Grande, *ca.* Río Frío, 11.viii.1968 E. Pérez-Silva *s.n.* (MEXU 6348 as "*A. peckiana*"); Llano Grande, 1 km from Río Frío, 18.viii.1963 Bertha Ochoa *s.n.* (MEXU 4050b as "*A. peckiana*"). **U.S.A.:** NORTH CAROLINA—Macon Co. - NW of Highlands, jct. Gold Mine Rd. & Hwy. 64, 28.vii.1987 D. Bixler *s.n.* (SFSU).

DISCUSSION

Amanita longitibiale is one of the relatively few taxa in section *Phalloideae* with cylindric to bacilliform spores. Unlike all such taxa previously described, *A. longitibiale* has a pigmented pileipellis. If pigmentation is set aside, the taxa that should be examined with relation to a claim of novelty for *A. longitibiale* are *A. cylindrispora* Beardslee (1936) known from the southeastern U.S.A., *A. gilbertii* Beauseigneur (1925) known from the Mediterranean region, and *A. virosiformis* (Murr.) Murr. (1941) [=?*A. tenuifolia* (Murr.) Murr. (1945)] known from the southeastern U.S.A.

The appearance of the volval limb in some exsiccata of *A. longitibiale* is quite reminiscent of the limb on the less radicating bulb of exsiccata of *A. cylindrispora*. However, in several of the exsiccata examined (*e.g.*, the portion of MEXU 23831 in RET), it is clear that the volva of *A. longitibiale* is truly saccate—often being connected to the bulb only in its lower 20± %.

Tulloss has examined many collections of *A. cylindrispora* including all of Beardslee's original material that could be located (BPI; CUP; FLAS; L; MICH; NCU; RET). The value of Q' obtained in this study exceeds 3.1. Also, while up to two thirds of the stipe of *A. cylindrispora* may be found below the surface of the substrate, the bulb is often not so markedly radicating as in *A. longitibiale* and takes up a smaller portion of the stipe. Moreover, the partial veil in *A. cylindrispora* is often rather small and delicate.



Figs. 4-5 *Amanita longitibiale* (holotype). 4. Elements of partial veil. 5. Elements of universal veil interior from volval limb.

A number of southern European and north African collections of *A. gilbertii* deposited in L have been examined by Tulloss. The spores of this species are very comparable in size and shape to those of *A. longitibiale*, the variable bulb of *A. gilbertii* may be somewhat radicating although the drawing in the protologue and an additional sketch by R. Bertault (deposited in L) show the base of the bulb as rounded. The partial veil of this species has more inflated cells than were found in that of *A. longitibiale*; and the subhymenium of *A. gilbertii* has considerably fewer inflated elements than does the subhymenium of the New World species.

The holotypes of *A. tenuifolia* and *A. virosiformis* (FLAS) have been examined by Tulloss—as part of an as yet unpublished study of North American white members of section *Phalloideae* having limbate volvas. The bulb in these species is not radicating as in *A. longitibiale* and the volval limb is brief; in the material examined to date, the spores have Q in the range 2.45 - 2.65.

Tulloss has examined the holotype collection (NYS) of *A. peckiana*, an isotype (MICH), and, in all, more than 80 specimens of the species in preparing an as yet unpublished monograph on *Amanita* section *Amidella* (E. J. Gilb.) Konr. & M. for North America. *Amanita longitibiale* differs from *A. peckiana* by its nonappendiculate pileus margin, its more persistent annulus, its rather deeply radicating stipe base, its subhymenium of inflated and partially inflated cells which is *not* dominated by hyphae running subparallel to the hymenial surface, its broad and markedly divergent lamella trama, etc.

MEXU 17384 was selected as holotype because the collection is in good condition, good color transparencies of it are located in MEXU, and it has been figured as an illustration of *A. peckiana sensu* Herrera & Pérez-Silva twice and (in both instances) was one of the specimens contributing to the accompanying description.

MEXU 4050b is immature with the partial veil still largely covering the lamellae and few spores present on the hymenium. However, we have concluded that it is appropriate to assign it to *A. longitibiale* because of its habit, coloring, and the anatomy of its subhymenium and lamella trama.

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CONTRIBUTIONS ON THE MORPHOLOGY AND TAXONOMY OF SOME RUMEN FUNGI FROM CANADA

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ABSTRACT - Eighty-five isolates of rumen fungi from moose, elk and bison were compared with 19 isolates from cattle and sheep. The morphological variation of five species: *Neocallimastix frontalis*, *Piromyces rhizinflata*, *P. mae*, *Orpinomyces joyonii* and *Anaeromyces mucronatus* is reported, and the impact of these observations on the identification and classification of rumen fungi is discussed

KEY WORDS: Rumen; fungi; taxonomy; *Neocallimastix*; *Piromyces*; *Orpinomyces*; *Anaeromyces*

INTRODUCTION

Anaerobic gut fungi from herbivores are classified in the Chytridiomycota, a phylum popularly known as chytrids. Based on biochemical evidence (Bartnicki-Garcia 1970, 1987), and on analysis of the 18S rRNA (Bowman et al. 1992, Dore and Stahl 1991, Li and Heath 1992), it has been shown that chytrids are true fungi, albeit morphologically primitive. The taxonomy of chytrids is as much an enigma to most mycologists as it is to bacteriologists. The problems in the study of chytrids are that they are difficult to isolate and grow in culture, and once in culture there is extensive morphological variation. For example, when cultured under different growing conditions an isolate may show so much variation that it could easily be mistaken as two or three unlike species. Morphological variation can be attributed to changes in the carbon source and medium (nutritional), the age of the culture, and strain differences. Among aerobic chytrids morphological variation crosses generic and family ranks, and attempts have been made to classify genera and higher taxa on zoospore ultrastructure (Barr 1980, 1990), but for practical reasons species must be recognizable on thallus morphology as seen in the light microscope. A full understanding of morphological variation is therefore essential before the classification and identification of gut fungi is perfected. However, much of the descriptive work has been done on a relative few isolates, and for some species on a single isolate. The examination of 85 isolates from the rumen of moose, elk, and bison, and 19 additional isolates from sheep and cattle provides useful information on morphological variation within the five species found, and contributes to a better understanding of their classification.

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* Contribution LRS#3879431

MATERIALS AND METHODS

Ruminal fluid was obtained by stomach tube and vacuum pump from a moose, bison and two elk. These animals were maintained in outdoor pens and the elk and bison were fed poor quality timothy hay ad libitum twice daily. The moose was allowed to browse freely on aspen (*Populus tremuloides*). Ruminal fluid was also collected from a ruminal fistulated Holstein steer fed alfalfa hay and from three fistulated Hereford steers fed either alfalfa or orchard grass of poor or good quality. Finally, samples were collected from two ruminal fistulated sheep fed diets of either 50% barley and 50% rye grass, or rye grass. Steers and sheep were housed in individual metabolisms stalls and fed twice daily.

Isolations were conducted using the anaerbobic technique of Hungate (1950) as modified by Bryant and Burkey (1953). A modification of Joblin's (1981) technique which included antibiotic control of bacterial contaminants (Bouchop and Mountford 1981) was used to isolate ruminal fungi from serial dilutions of ruminal fluid plated on agar. Plates were incubated in an anaerobic chamber under an atmosphere of 90% CO_2:10% H_2 at 39°C. Once isolated, fungi were maintained on defined medium B (Lowe et al. 1985) modified to contain either Whatman No.

1 filter paper or cellophane dialysis tubing as carbon sources. Dialysis tubing was parboiled, washed, reboiled and rewashed to remove glycerol before use. Cultures were viewed by light microscopy under phase contrast illumination as described by Barr et al. (1989). Out of 104 isolates only four were unidentified because of poor growth.

OBSERVATIONS

Neocallimastix frontalis (Braune) Heath (Figs. 1-7)

Fifty-three isolates were examined from sheep, moose, bison and elk. The morphology of these on dialysis tubing compared very favorably with the description of *N. variabilis* Ho & Barr (Ho et al. 1993). However, there is substantial morphological variation influenced by nutrition. Moreover, a critical comparison of the type isolates of *N. frontalis* from New Zealand and *N. patriciarum* Orpin & Munn from the United Kingdom, with isolates of *Neocallimastix* from the U.S.A. (Wubah 1991) provides compelling evidence that *N. variabilis*, *N. patriciarum*, and possibly *N. hurleyensis* Theodorou & Webb are synonymous with *N. frontalis*.

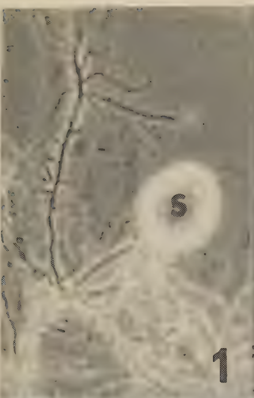
There was no conspicuous variation between isolates in either zoospore size or flagellum length. Zoospores were ovoid to globose and most were 6-9 μm diameter, occasionally as small as 5 μm or as large as 13 μm. Flagella of fixed zoospores tend to cling together whereas those of living zoospores are readily shed. The only certain way of counting the number of flagella accurately is by ultrastructural examination of zoospores in mature sporangia and counting the number of basal bodies (kinetosomes) or flagella in cross section, a task which obviously cannot be done for more than a few zoospores, and was beyond the scope of this study. All active zoospores were polyflagellate but many quiescent, and presumably moribund zoospores were uniflagellate. Ultrastructurally there is a lateral root of micro- and megatubules (Heath et al. 1983, Li et al. 1991), and most likely one basal body has firmer anchorage than the others, and is shed last. Thus, on examination of a few quiescent zoospores, a culture of *N. frontalis* might mistakenly be determined as *Piromyces communis* Gold, a morphological similar species that is uniflagellate.

Endo- exogenous sporangial development was affected by the media. Endogenous sporangia developed from enlargement of zoospore cysts

(Figs. 1-2); there were no sporangiophores. Exogenous sporangia develop from the apical germination of zoospore cysts; the germ tube grows into a tubular sporangiophore (Fig. 3) and the sporangium develops terminally (Fig. 4). On filter paper cultures examined were primarily endogenous with globose sporangia. On dialysis tubing cultures were mostly exogenous with ellipsoidal sporangia. Previous observations of isolates of *Neocallimastix* sp. from a Holstein steer (Barr et al. 1989) reported that sporangia grown on dialysis tubing were primarily endogenous, and only about 5% were exogenous. This contrasts with our observations of isolates from moose, bison, elk and sheep in which the sporangia were primarily exogenous. Some sporangiophores were over 1 mm long. The frequency of exogenous thalli may be a matter of natural selection related to the environment of the host animal, and the quality of feed. Thus, from range animals (this study) and animals in the tropics (Ho et al. 1993) where the quality of feed is generally poor, there may be a natural selection for *Neocallimastix* with exogenous growth forms.

The most striking variation in the morphology of our isolates was in the branching of the sporangiophore. Most often the sporangiophore was unbranched and developed a single sporangium. When branching occurred (Fig. 5), a second sporangium started to develop but aborted early in development, or if it developed it failed to produce zoospores. Less often there were two mature sporangia (Figs. 6-7), and rarely three. Multisporangial thalli appeared to be more common in some isolates than in others and the frequency of these isolates was not correlated with host species. In many isolates branched sporangiophores were not seen at all, but in others they occurred infrequently, and in two isolates the frequency of multisporangial forms probably exceeded 10%. The significance of this observation is that a single isolate with a high frequency of multisporangial forms could easily be considered sufficiently distinct to be a new species. Our observations of numerous isolates show that this is

Figures 1-7. *Neocallimastix frontalis*. Fig. 1. Endogenous development of a young sporangium (S). x 340. Fig. 2. A mature sporangium (S) developed endogenously. x 280. Fig. 3. Exogenous development; a sporangiophore (Sp) growing from the zoospore cysts (ZC). x 340. Fig. 4. A mature sporangium (S) developed at the apex of the sporangiophore. x 280. Fig. 5. A long, branched sporangiophore showing one sporangium (S). x 280. Figs. 6-7. Short, branched sporangiophores with pairs of sporangia. x 570.



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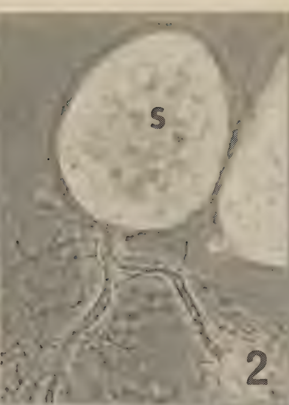

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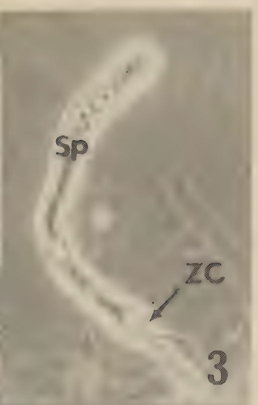

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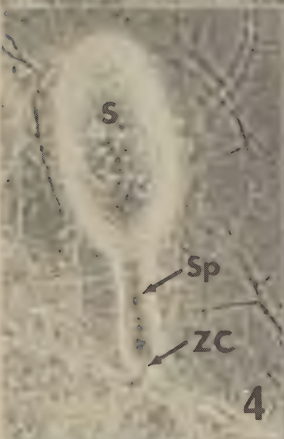

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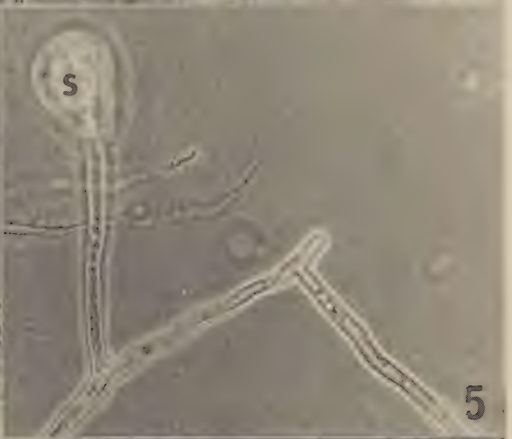

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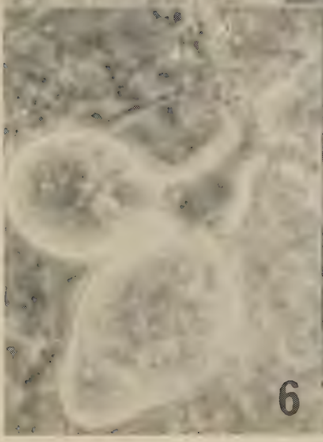
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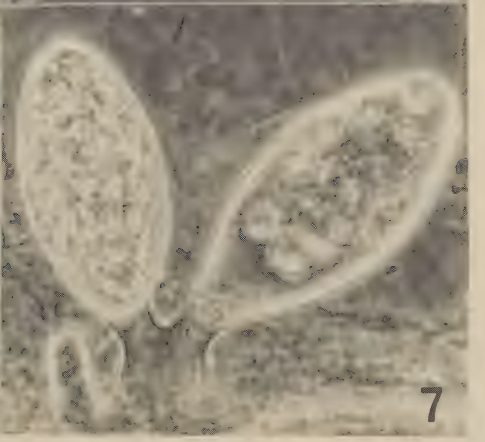
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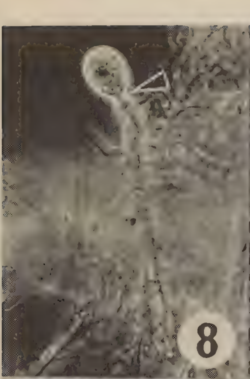
a natural variation between isolates of *N. frontalis*, and that the description for the species should be expanded to accommodate these forms.

Piromyces rhizinflata Breton et al. (Figs. 8-16)

This species was originally isolated by Breton et al. (1991) from fecal material of a Saharian ass in Tunisia. In our study twenty-one isolates were examined from the rumen of bison, two from moose and one from an elk. Sporangia developed both endogenously and exogenously. The apparent difference in descriptions of the Tunisian and Albertan isolates probably relates to the application of terms, but there are also real morphological differences attributable to the substrate. Breton et al. (1991) report the occasional presence of a short sporangiophore on thalli grown on filter paper, but elsewhere state there is an absence of sporangiophores, and that sporangia are strictly endogenous. We consider the presence of a short sporangiophore (see their Fig. 1d) determines that the sporangium can also be exogenous. On dialysis tubing our isolates often developed a short sporangiophore, but did so infrequently on filter paper.

The conspicuous character of *P. rhizinflata* was the constricted neck, that often appeared as a refringent ring or slightly elongated and isthmus-like (Figs. 8-15). (The neck is a point between the sporangium and rhizoid, and the port is the opening in the neck.) In this species these characteristics are determined during very early thallus development (Figs. 8-11). Initially, the zoospore cyst enlarges simultaneously with

Figures 8-16. *Piromyces rhizinflata*. Figs. 8-11. Immature thalli each with a highly constricted point (arrowhead) between the zoospore cyst and main rhizoid. x 340. Fig. 12. A mature sporangium on a short sporangiophore, a constricted point (arrowhead) and rhizoidal system below. x 340. Fig. 13. An elongated sporangium with constricted point (arrowhead) and rhizoids below. x 570. Fig. 14. An exogenous sporangium (S) on a short sporangiophore, a constricted point (arrowhead) and rhizoid; a second sporangium (2) is superimposed over the rhizoidal system. x 570. Fig. 15. A mature sporangium formed endogenously, a constricted point (arrowhead) and main rhizoid. x 340. Fig. 16. A mature sporangium growing on the edge of a filter paper. x 280.



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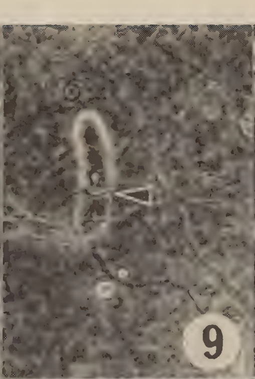

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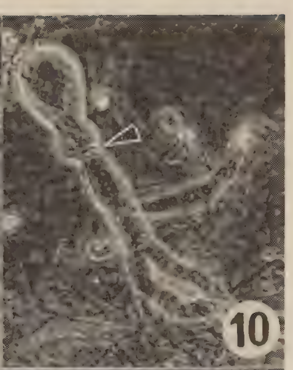

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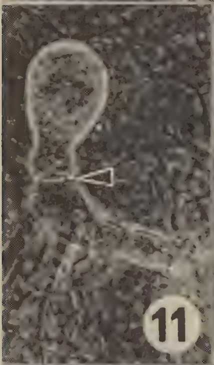

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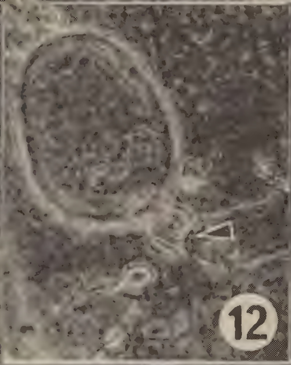

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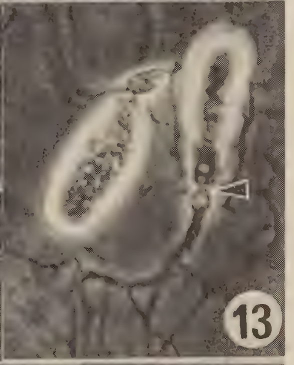

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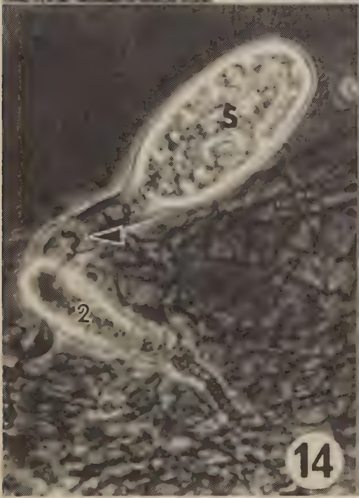

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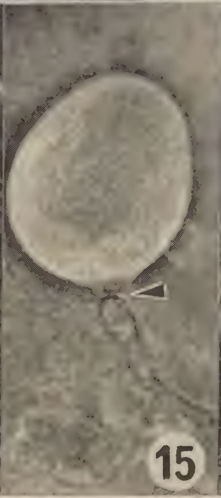

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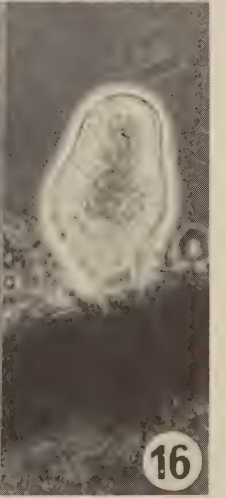

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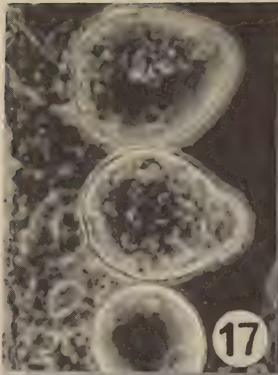
development of a fine (rhizoidal) germ tube. Then the base of the cyst becomes slightly thickened as the apical side enlarges. The thickening of the base presumably prevents expansion of the port, and contributes to the refringent ring. Simultaneous with apical expansion of the cyst, there was an expansion of the main rhizoid below the neck. The cyst enlarged into an endogenous sporangium, or a sporangium formed from the apex of the cyst (Fig. 12) with or without a septum, or a sporangium developed from a short sporangiophore (Fig. 14). There was great variation in sporangium shape and size. Sporangia were as small as 8 X 20 μm, and these were elongated, ovate or pyriform. Larger sporangia were broadly ellipsoidal to more or less spherical. The largest sporangia were 130 μm in diameter but these became moribund. Zoospore discharge occurred following dissolution of an apical pore, and following discharge the sporangium wall remained temporarily intact.

P. rhizinflata is distinct from *P. communis* based on rhizoidal development, the absence of long sporangiophores when compared on dialysis tubing, the presence of a wide discharge pore, a persistent sporangium wall following discharge, and the shape of the sporangium. *P. rhizinflata* differs from both *P. spiralis* Ho which has more spherical sporangia, highly evanescent sporangial walls, and markedly coiled rhizoids, and *P. minutus* Ho which has conspicuously small sporangia. *P. rhizinflata* may be similar to *P. dumbonica* Li but information of the morphology of this latter species is scant. Differences with *P. mae* Li are discussed below.

Piromyces mae Li (Figs. 17-20)

This species was originally described from horse fecal material in New Zealand (Li et al. 1990). Additional observations of an isolate from the rumen of a sheep in France were reported by Gaillard-Martinie et al. (1992). We discovered three isolates from the rumen of an elk. Sporangia

Figures 17-20. *Piromyces mae*. Fig. 17. Ovate sporangia with apices. x 570. Figs. 18-19. Sporangia with hyaline material covering the discharge papillae. x 570. Fig. 20. A broad, apical discharge pore. x 570. Figs. 21-22. *Orpinomyces joyonii*, sporangiophore complexes developing as outgrowths from the hyphae (arrows). x 340. Figs. 23-25. *Anaeromyces mucronatus*. Fig. 23. A sporangium with projection (arrow) at the apex. x 340. Figs. 24-25. Mycelium with constricted points (arrows). x 340.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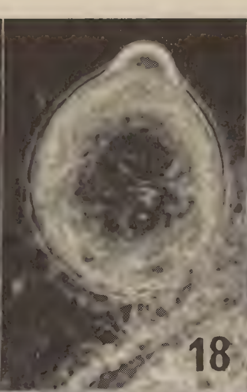
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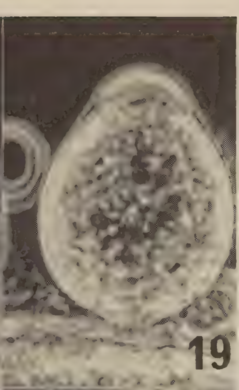
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were strictly endogenous. Small sporangia were ovate, 12 X 20 μm and larger sporangia globose, 35-60 μm diam. The main rhizoid was not conspicuously inflated, and only occasionally as broad as 8 μm. In the two elk surveyed, *P. mae* occurred in one animal and *P. rhizinflata* in the other. The differences between the two species are the discharge papillae, the neck constriction, and our isolates of P. mae were strictly endogenous. The discharge area in *P. mae* was usually conspicuous as a knob-like projection (Fig. 17), and in many instances there was a noticeable arc of hyaline material (Figs. 18-19). In both species following discharge there was a wide pore (Fig. 20) and the wall was persistent for a while in contrast to *P. communis* which has a highly evanescent wall. The neck in *P. mae* was often constricted as in *P. rhizinflata*, but in other thalli it was broader and the port wide. Nonetheless, there is an overlap in characters between these two species, and on examination of a few thalli it might be difficult to make an accurate determination.

Orpinomyces joyonii (Breton) Li (Figs. 21-22)

This species was described from the rumen of a sheep in France (Breton et al. 1989), and is considered synonymous with *O. bovis* Barr & Kudo from the rumen of a Holstein steer in Alberta (Barr et al. 1989). We have four additional isolates from sheep. This species and *Anaeromyces mucronatus* tend to lose their ability to produce sporangia in culture. Sterile cultures cannot be identified with absolute certainly, but there are morphological characteristics that distinguish the two species. In sterile mycelium of *O. joyonii* there are small sporangiophore initials consisting of swollen lateral outgrowths which generally become lobed and a few develop into sporangiophore complexes without producing mature sporangia (Figs. 21-22). In *O. intercalaris* Ho, a species only recently described from Malaysia (Ho et al. 1994), sporangia develop from the expansion or lateral outgrowth of a hypha, but not from lobed complexes. In *A. mucronatus* these structures are absent.

Anaeromyces mucronatus Breton (Figs. 23-25)

This species was originally described from a Holstein cow in France (Breton et al. 1990), and was concurrently seen from a Holstein steer in Alberta (unpublished). In our present study we obtained one isolate from the rumina of each of the four cattle, and 15 from the rumina of two elk. Three isolates from elk and one from cattle produced a few sporangia and uniflagellate zoospores. Most sporangia were fusiform (i.e. with a pointed apex) and each sporangium was borne on a simple sporangiophore (Fig. 23) which are characters consistent with the description. The hyphae of both *O. joyonii* and *A. mucronatus* have constricted hyphae, but in *A. mucronatus* these constrictions are much more frequent (Figs. 24-25), often catenate (in a series), and the constrictions may be isthmus-like.

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TAXONOMICAL STUDIES ON USTILAGINALES. XII.*

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ABSTRACT

The following groups of Ustilaginales were studied: the genera Dermatosorus and Macalpinomyces; smut fungi of Uncinia, Capillipedium, Isachne and Coix; and Tilletia of Dactyloctenium.

NEW GENUS proposed: Endosporisorium K. Vánky, type E. capillipedii (J. N. Mishra) K. Vánky, on Capillipedium and Chrysopogon.

NEW SPECIES proposed: Anthracoidea unciniae K. & C. Vánky (type on Uncinia hamata); Dermatosorus cyperi K. Vánky (type on Cyperus aff. celluloso-reticulatus); Macalpinomyces sharmae K. Vánky (type on Panicum sumatrense); Tilletia dactyloctenii K. Vánky (type on Dactyloctenium aegyptium).

NEW COMBINATIONS proposed: Endosporisorium capillipedii (J. N. Mishra) K. Vánky, based on Sorosporium capillipedii (type on Capillipedium parviflorum); Endosporisorium loudetiae (Viennot-Bourgin) K. Vánky, based on Sorosporium loudetiae (type on Loudetia cf. arundinacea); Sporisorium lacrymae-jobi (Mundkur) K. Vánky, based on Ustilago lacrymae-jobi (type on Coix lacryma-jobi); Sporisorium monakai (J. N. Mishra) K. Vánky, based on Sphacelotheca monakai (type on Isachne dispar); Sporisorium mysorense (Pavgi & Thirumalachar) K. Vánky, based on Sphacelotheca mysorensis (type on Capillipedium huegelii); Tilletia sumatii (S. D. Patil & R. V. Gandhe) K. Vánky, based on Neovossia sumatii (type on Coix lacryma-jobi); Ustilago standleyana (Zundel) K. Vánky, based on Cintractia standleyana (type on Rhynchospora glauca).

SYNONYM: Sphacelotheca pakistanica Ahmad is a synonym of Sporisorium capillipedii (L. Ling) L. Guo (types on Capillipedium parviflorum).

EXCLUDED SPECIES: Sorosporium marina B. D. Kundalkar & M. S. Patil (= Plasmodiophora halophilae Karling, Plasmodiophorales).

A new species of Dermatosorus.

The genus Dermatosorus was erected by Sawada (in Ling, 1949:267) to accommodate a smut forming peculiar spore balls in some of the ovaries of Eleocharis dulcis Trin. Thirumalachar & Narasimhan (1952:409) described a new genus, Zundelula, which is "closely related to Dermatosorus Sawada". Langdon (1977) studied the types of these two genera, and concluded that "The origin of the sporogenous hyphae and the pattern of spore ball development in *Z. fimbristylidis* are the same as in *D. eleocharidis*". Consequently, he transferred *Zundelula fimbristylidis* into the genus *Dermatosorus*, and considered *Zundelula* to be a synonym of *Dermatosorus*. Vánky (1987) studied the genus *Dermatosorus* and recognized four species: 1. *D. eleocharidis* Sawada, in Ling, 1949:268, type on *Eleocharis dulcis* Trin., Taiwan, Kang-shan, Kao-hsiung, 10.IV.1919, Y. Shimada (BPI!). 2. *D. bulbostylidis* (Thirumalachar & M. S. Pavgi) K. Vánky, 1987:63 (based on *Zundelula bulbostylidis*), type on *Bulbostylis capillaris* Kunth, India, Varanasi. 19.X.1953, M. S. Pavgi (1241). 3. *D. fimbristylidis* (Thirumalachar & Narasimhan) Langdon, 1977:450 (based on *Zundelula fimbristylidis*), type on *Fimbristylis* sp., India, Patna, 12.XII.1951, M. J. Narasimhan (BPI!, IMI!). 4. *D. thirumalacharii* (M. S. Pavgi & B. K. Giri) K. Vánky, 1987:64 (based on *Zundelula thirumalacharii*), type on *Scirpus supinus* L., India, Varanasi, 10.XII.1963, M. S. Pavgi (321) & B. K. Giri.

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*Studies in Heterobasidiomycetes, part 103

A smut fungus on a *Cyperus*, recently collected in Venezuela, turned out to be an unknown species of *Dermatosorus*:

Dermatosorus cyperi K. Vánky, **sp. nov.**

Typus in matrice *Cyperus* aff. *celluloso-reticulatus* Böckeler (det. P. Goetghebeur), Venezuela, Estado Apure, ca. 94 km W. San Fernando de Apure, pr. oppid. Achaguas, 7°48’ N, 68°17’ W, alt. ca. 100 m., 5.XII.1993, leg. R. Berndt, C. & K. Vánky. Holotypus in Herbario Ustil. Vánky (HUV 15991!); isotypi in BPI (802365), IMI (361194), VEN, VIA and in Vánky, Ustilaginales exs. no. 905.

Sori (Fig. 1, 2) in ovariis nonnullis, in inflorescentia dispersis, inconspicui, ovoidei usque cylindrici, saepe parum curvati, apice acuti, 0,5–1 x 2–3(–4) mm, glomerulis sporarum arte farcti, membrana ("peridio") tenui, levi, pallide brunnea ex pariete ovarii et e strato subtili hypharum composita cooperti. Columella praesens, composita e parte brevi, conica, centrali, origine matricali atque fungali, prolongata in massam centralem albam, ramosam, origine fungalem, in hiatus inter sporas juveniles et basales et centrales penetrantem. Membrana sori in statu maturo irregulariter rupta globos glomerulorum agglutinatorum vel separatorum sporarum ostendens. Glomeruli sporarum (Fig. 2, 3) satis permanentes, propter mutuum pressum irregulariter polyedrici, 130–320 x 200–400(–440) µm, atrobrunnei, opaci, e strato solo cellularum corticalium sterilium, e multitudine sporarum, deinde inter sporas texto tenuiter evoluto, pseudoparenchymatico cellularum fungalium, parvarum (0,5–1,5 µm diam.), polygonorum, tenuiter tunicatarum (0,2–0,3 µm), vacuarum compositi. Sporae (Fig. 4, 5) globosae, subglobosae, ovoideae usque ellipsoideae, 8,5–11(–12) x 9–13(–15) µm, pallide subrufobrunneae; pariete tenui (1–1,5 µm, simul cum ornamento), subtiliter reticulato (maculis 6–10 per diametrum), sub SEM interspatia maculorum delicate et densiuscule verrucosa. Cellulae corticales (Fig. 3, 4) forma et magnitudine sporis similes (8–12 x 10–16 µm diam.), sed atro-rufobrunneae, crasse tunicatae (1.5–2.5 µm, simul cum reticulo), vacuae. Germinatio sporarum (Fig. 8; in agaro aquoso, 30 C°, per unam diem) basidia septata, 6–8-cellularia, subcylindrica, 1,5–2,5 x 50–65 µm, cum lateralibus et terminalibus basidiosporis efficiens. Cellulae basidii faciliter in 4 partes, plerumque 2-cellulares, separatae productionem basidiosporarum continuentes. Basidiosporae ovoideae usque ellipsoideae, 1–1,5 x 3–12 µm, hyalinae.

Sori (Figs. 1, 2) in some of the ovaries, scattered in the inflorescence, inconspicuous, ovoid to cylindrical, often slightly curved, with an acute tip, 0.5–1 x 2–3(–4) mm, tightly filled with spore balls, covered by a thin, smooth, light brown membrane ("peridium") composed of the ovary wall and a delicate layer of hyphae. Columella present, composed of a short, central, conical part of host- and fungus origin, prolongated into a white, ramified, central mass of fungal origin, which penetrates into the spaces between the young, basal and central spore balls. At maturity, the sorus membrane ruptures irregularly disclosing single or agglutinated spore balls. Spore balls (Figs. 2, 3) rather permanent, irregularly polyhedral by mutual pressure, 130–320 x 200–400

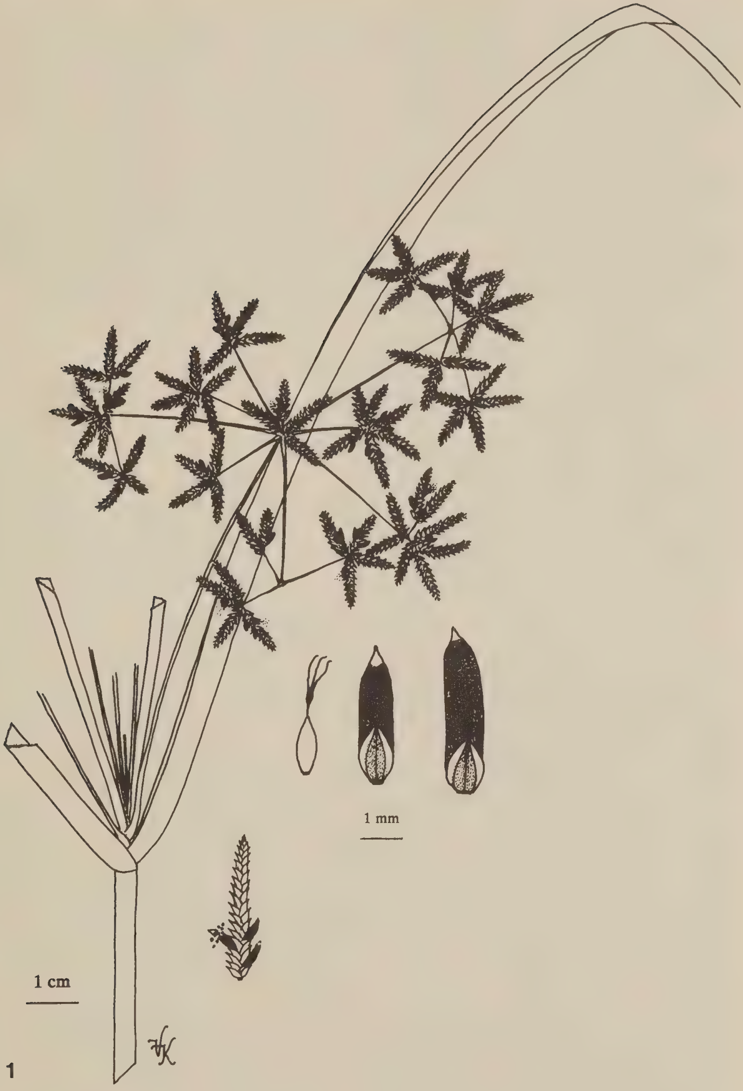


Fig. 1. Dermatosorus cyperi K. Vánky (type) on Cyperus aff. celluloso-reticulatus Böckeler. Part of an inflorescence with sori in some of the ovaries. Enlarged, a spikelet with three sori, a healthy seed and two sori.

(–440) µm, dark brown, opaque, composed of a single layer of cortical sterile cells, many spores and between the spores a poorly developed, pseudoparenchymatous tissue of small (0.5–1.5 µm in diam.), polyhedral, thin-walled (0.2–0.3 µm), empty fungal cells. Spores (Figs. 4, 5) globose, subglobose, ovoid to ellipsoidal, 8.5–11(–12) x 9–13(–15) µm, light reddish-brown; wall thin (1–1.5 µm, including ornamentation), finely reticulate, 6–10 meshes per spore diameter, in SEM interspaces finely and densely verruculose. Cortical cells (Figs. 3, 4) similar to the spores in shape and size (8–12 x 10–16 µm in diam.) but dark reddish-brown, thick-walled (1.5–2.5 µm, including reticulum), empty. Spore germination (Fig. 8; on water agar, at 30 C^{0}, within one day) results in septate, 6–8-celled, subcylindrical basidia, 1.5–2.5 x 50–65 µm, producing laterally and terminally basidiospores. Basidial cells easily separate into four, usually 2-celled units which continue to produce basidiospores. Basidiospores ovoid to ellipsoidal, 1–1.5 x 3–12 µm, hyaline.

Key to the known *Dermatosorus* species.

1. Cortex of spore balls many-layered, composed of firmly united, smooth-walled sterile cells. On *Eleocharis* .... *D. eleocharidis*
– Cortex few-layered, composed of loosely united, reticulate-walled sterile cells 2
2. Cortex 1–2-layered. Spores 8.5–13 µm 3
– Cortex 2–3-layered. Spores 7–11 µm 4
3. Spore balls 150–190 µm long. On *Bulbostylis* .... *D. bulbostylidis*
– Spore balls 200–440 µm long. On *Cyperus* .... *D. cyperi*
4. Cells of cortex 10–19 µm. On *Fimbristylis* .... *D. fimbristylidis*
– Cells of cortex 8.5–14.5 µm. On *Scirpus* .... *D. thirumalacharii*

The smut fungi of *Uncinia* (Cyperaceae).

Hitherto only one smut fungus has been reported on *Uncinia*, from Australasia:

Anthracoidea sclerotiformis (Cooke & Massee) Kukkonen, 1963:64.

Ustilago sclerotiformis Cooke & Massee, in Cooke, 1888:8. – *Cintractia sclerotiformis* (Cooke & Massee) Cunningham, 1924:421. – Type on *Uncinia caespitosa* Boott (= *Uncinia leptostachya* Raoul vel sp. aff., rev. S. Hooper, 1962; Subgen. *Uncinia*, Sect. *Stenandrae*), New Zealand, Tahoraiti, T. Kirk (321; K!).

Sori around the nuts, ovoid, first enclosed in the utricle and also covered by a white, fungal membrane, later becoming exposed, black, powdery on the surface. Spores slightly flattened, in lateral view elliptic, in plane view angularly irregular, 11–18 x (14–)16–22(–24) µm, dark reddish-brown; wall 1–2 µm thick, uneven, thickest at the angles (up to 3 µm), light-refractive spots and 2–4, low internal swellings may be present; surface densely, finely to evidently verruculose.

Fig. 2. T. S. of a sorus of *Dermatosorus cyperi*, with the large, irregular spore balls and the distal, fungal part of the central columella (type). Bar = 100 µm.

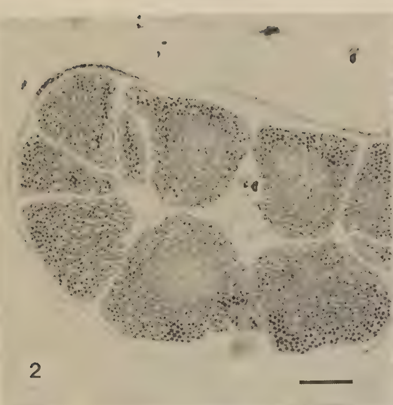
Fig. 3. T. S. of a sorus of *D. cyperi* showing parts of some spore balls with the cortical layer of large, thick-walled, empty sterile cells, spores, and between the spores minute, thin-walled, empty sterile cells (type). Bar = 10 µm.

Fig. 4. Light coloured spores and dark coloured sterile cells of *D. cyperi* in LM. (type). Bar = 10 µm.

Fig. 5. Spores of *D. cyperi* in SEM (type). Bar = 5 µm.

Fig. 6. Spores of *Anthracoidea unciniae* (type) in LM, with the dark areas of well-developed internal swellings. Bar = 10 µm.

Fig. 7. Spores of *A. unciniae* (type) in SEM. Bar = 10 µm.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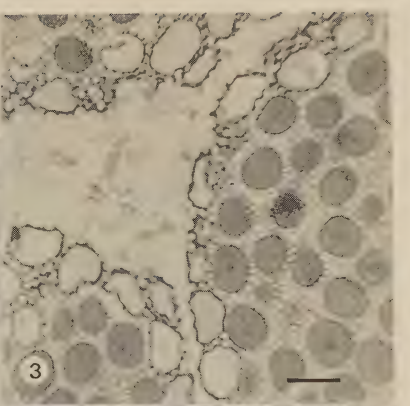
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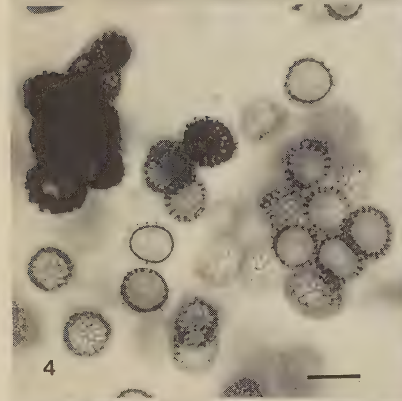
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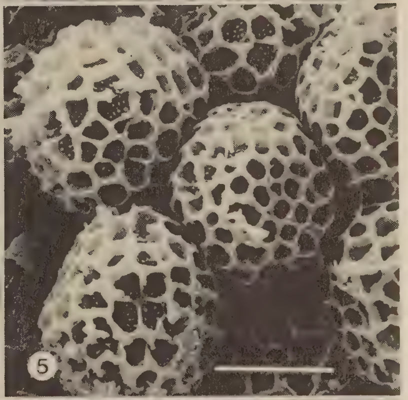
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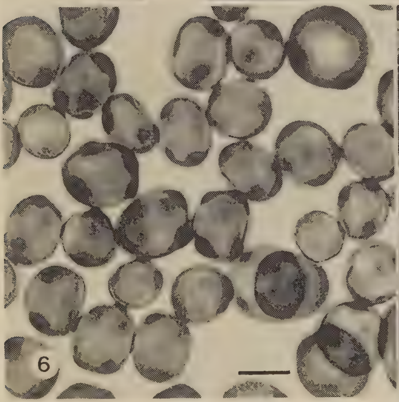
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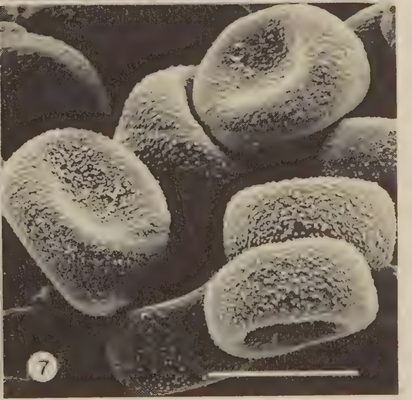
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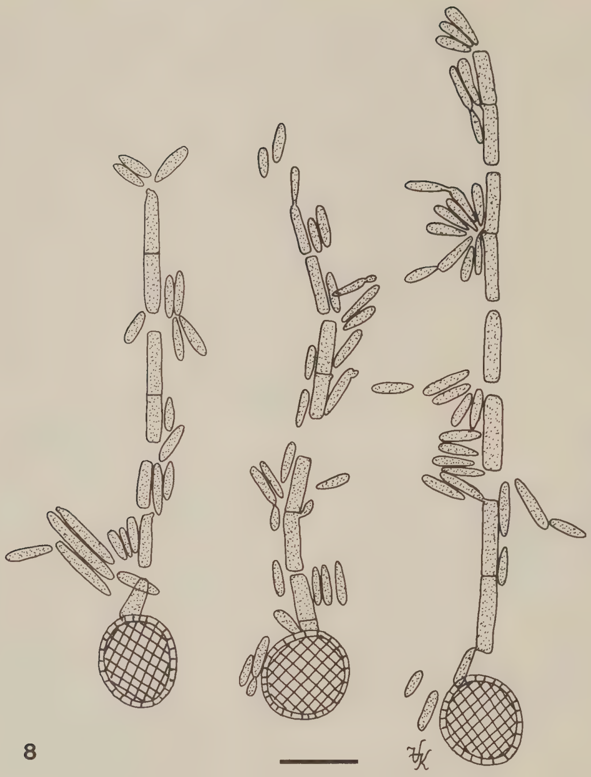
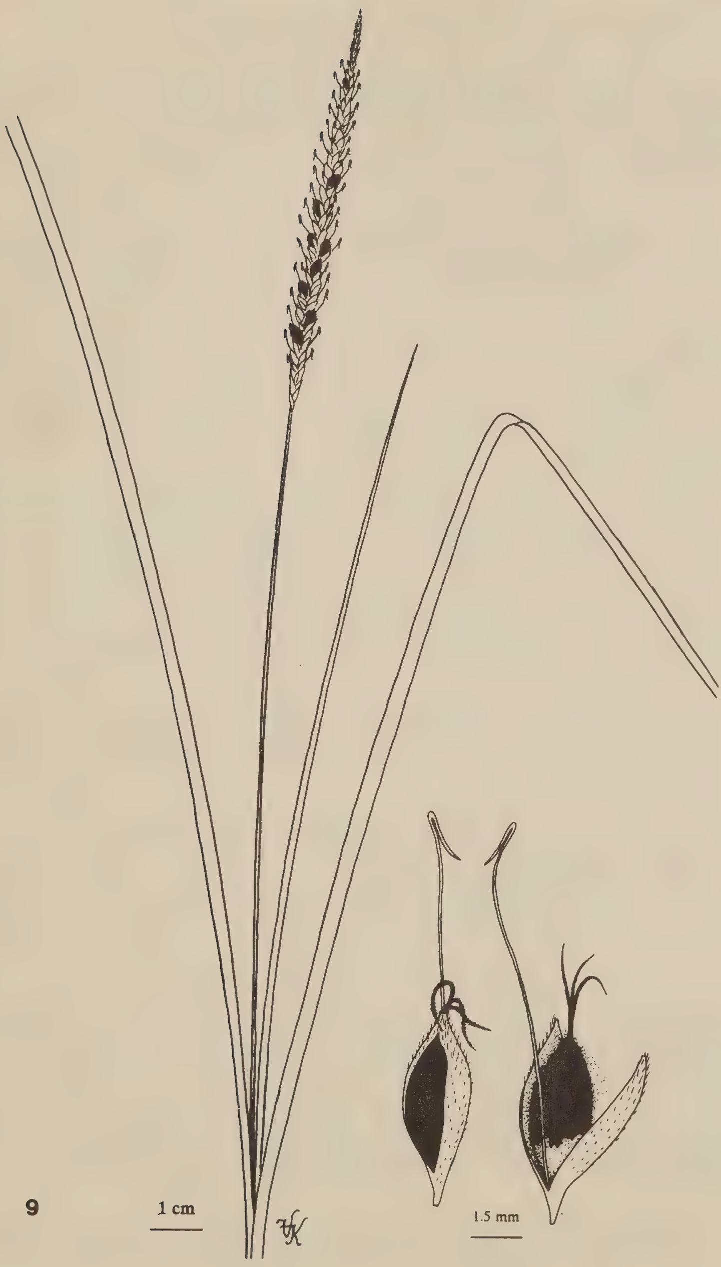


Fig. 8. Germinating spores of Dermatosorus cyperi (type; spore ornamentation schematic). Bar = 10 µm.

Fig. 9. Anthracoidea unciniae K. & C. Vánky on Uncinia hamata (type). Enlarged, two sori.



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Recently, a different Anthracoidea species was collected in Venezuela:

Anthracoidea unciniae K. & C. Vánky, **sp. nov.**

Typus in matrice Uncinia hamata Urb. (Subgen. Uncinia, Sect. Platyandrae), Venezuela, Distr. Federal, 10 km E.N.E. oppid. Colonia Tovar, 10°26’ N, 67°16’ W, alt. ca. 2020 m., 15.XII.1993, leg. R. Berndt, C. & K. Vánky. Holotypus in Herbario Ustil. Vánky (HUV 15999); isotypi in VEN, VIA and in Vánky, Ustilaginales exsiccata no. 903.

Sori (Fig. 9) circum nuces, ellipsoidei, 1–2 x 2,5–3,5 mm in diametro, primo utriculo inclusi, et iam membrana alba, fungali cooperti, deinde expositi. Massa sporarum nigrescenti-brunnea, semiagglutinata, ad superficiem sori pulverea. Sporae (Fig. 6, 7) quoad formam et magnitudinem variabiles, parum compressae (9–12 µm crassae), e latere visu circulares, ellipticae, subangulares vel irregulares, 10–15(–17) x 11–17(–20) µm, mediocriter rufobrunneae; pariete tenui (0,5–1,5 µm), inaequaliter incrassato propter 3–6 tumores interiores extraordinarie bene evolutos (1,5–3,5 µm), atrobrunneos et nonnunquam incrassationes in angulis; areae refractivae nullae; superficie conspicue levi, usque leniter punctato, sub SEM raro usque dense minuteque verruculoso.

Sori (Fig. 9) around the nuts, ellipsoidal, 1–2 x 2.5–3.5 mm in diameter, first enclosed in the utricle and also covered by a white, fungal membrane, later becoming exposed. Spore mass blackish-brown, semiagglutinated, on the sorus surface powdery. Spores (Figs. 6, 7) variable in shape and size, slightly flattened (9–12 µm thick), in plane view circular, elliptic, subangular or irregular, 10–15(–17) x 11–17(–20) µm, medium reddish-brown; wall thin (0.5–1.5 µm) unevenly thickened due to 3–6 extremely well-developed (1.5–3.5 µm thick), dark brown internal swellings and sometimes also thickenings of the angles, light-refractive areas absent; surface apparently smooth to finely punctate, in SEM sparsely to densely, minutely verruculose.

It is interesting to note that these two Anthracoidea species parasitize Uncinia species belonging to different sections. In Anthracoidea species of Carex, a species delimitation on the level of host plant sections was also demonstrated (comp. Vánky, 1979).

Key to the Anthracoidea species of Uncinia.

– Spore mass black, spores irregular, evidently verruculose,
internal swellings low, light-refractive areas present . . . . . A. sclerotiformis
– Spore mass blackish-brown, spores less irregular, finely punctate,
internal swellings thick, light-refractive areas absent . . . . A. unciniae

A new species of Macalpinomyces.

The genus Macalpinomyces was proposed by Langdon & Fullerton (1977:30) for Sorosporium eriachnes Thümen, possessing ovaricolous sori covered by a peridium of host and fungal origin, and pigmented, mostly irregularly polygonoid spores intermixed with giant sterile cells.

Sharma & Khare (1987) reported two new smut diseases of little millet (Panicum sumatrense) caused by Tilletia narasimhanii Thirum. & Safeeulla and Tolyposporium sp. This latter smut turned out to be an undescribed species:

Macalpinomyces sharmae K. Vánky, **sp. nov.**

Typus in matrice Panicum sumatrense Roth ex Roem. & Schult., India, Madhya Pradesh, 35 km E. Jabalpur, 11.X.1992, leg. N. D. Sharma, S. R. Singh, M. B. Nagar, S. Nema, C. & K. Vánky. Holotypus in Herbario Ustil. Vánky (HUV 16017!); isotypi in BPI (802367) and in Vánky, Ustilaginales exsiccata (inedited). Paratypi: India, M. P., Mandla, 3.IX.1984, leg. N. D. Sharma (HUV 16054!); 20.IX.1992, leg. A. K. Jain, comm. N. D. Sharma (HUV 16056!); Rewa, 16.IX.1991, leg. A. K. Jain, comm. N. D. Sharma (HUV 16055!); 26.IX.1991, leg. N. D. Sharma (HUV 16013!). Paratypus in matrice Setaria pallide-fusca (Schumacher) Stapf & C. E. Hubb., India, M. P., 52 km E. Jabalpur, alt. ca. 580 m, 11.X.1992, leg. N. D. Sharma, S. R. Singh, M. B. Nagar, S. Nema, C. & K. Vánky (HUV 16053!).

Sori (Fig. 10) in ovariis sparsis, inconspicui, per partes florales absconditi, ovoidei, 0,8–1 x 2 mm, membrana (peridio) pro ratione crassa, pallide- usque atrobrunnea cooperti, serius membrana irregulariter rupta, massam nigrescenti-brunneam, granulosam glomerulorum sporarum et simul cum illis cellulas steriles intermixtas ostendentes. Peridium (Fig. 11) e strato externo origine matricali (pericarpio) et e strato interno crasso, origine fungali, in ipso glomeruli sporarum efformantes; cellulae inter glomerulos sporarum in cellulas steriles transformantes. Glomeruli sporarum (Fig. 12, 13) forma et magnitudine variabiles, plerumque irregulares, 25–70 x 30–100(–120) µm, atro-rufobrunnei, e multitudine sporarum satis permanenter agglutinatarum compositi. Sporae (Fig. 12, 13) subglobosae, ovoideae, plerumque subpolyedriter irregulares, 6,5–9 x 7–10,5(–11) µm, flavidobrunneae; pariete tenui (cca. 0,5 µm), leniter et dense punctato-verruculoso. Cellulae steriles (Fig. 12, 13) subglobosae, ovoideae usque parum irregulares, sporas magnitudine superantes (9–12 x 11–17 µm), singulae vel in greges laxos unitae, subhyalinae usque pallide flavidobrunneae; pariete cca. 1 µm crasso, levi. Germinatio sporarum (Fig. 14, 15; in agaro aquoso, temperatura in conclavibus solita, post 6 dies peractas) basidia uni- vel biseptata (2–3,5 x 17–35 µm) cum basidiosporis lateralibus et terminalubus efficiens. Basidiosporae ovoideae usque longe ellipsoideae, 1,5–2,5 x 3–8 µm, hyalinae, sicut fermenta germinantes.

Sori (Fig. 10) in scattered ovaries, inconspicuous, hidden by the floral envelopes, ovoid, 0.8–1 x 2 mm, covered by a relatively thick, light- to dark brown membrane (peridium) which ruptures irregularly to expose the blackish-brown, granular mass of spore balls intermixed with sterile cells. Peridium (Fig. 11) composed of an external layer of host origin (pericarp) and a thick, internal layer of fungus origin, in which the spore balls differentiate; the fungal cells between the spore balls are transformed into sterile cells. Spore balls (Figs. 12, 13) variable in shape and size, mostly irregular, 25–70 x 30–100(–120) µm, dark reddish-brown, composed of many rather permanently agglutinated spores. Spores (Figs. 12, 13) subglobose, ovoid, usually subpolyhedrally irregular, 6.5–9 x 7–10.5(–11) µm, yellowish-brown; wall thin (ca. 0.5 µm), finely and densely punctate-verruculose. Sterile cells (Figs. 12, 13) subglobose, ovoid to slightly irregular, larger than the spores (9–12 x 11–17 µm), single or in loose groups, subhyaline to light yellowish-brown; wall ca. 1 µm thick, smooth. Spore germination (Figs. 14, 15; on water agar, at room temperature, after 6 days) results in one or two septate basidia (2–3.5 x 17–35 µm) on which laterally and terminally basidiospores are produced. Basidiospores ovoid to long ellipsoidal 1.5–2.5 x 3–8 µm, hyaline, germinate like yeasts.

This species is dedicated to its discoverer, the sharp-eyed Indian botanist from Jabalpur, an excellent mycologist, personality and friend, Dr. N. D. Sharma.

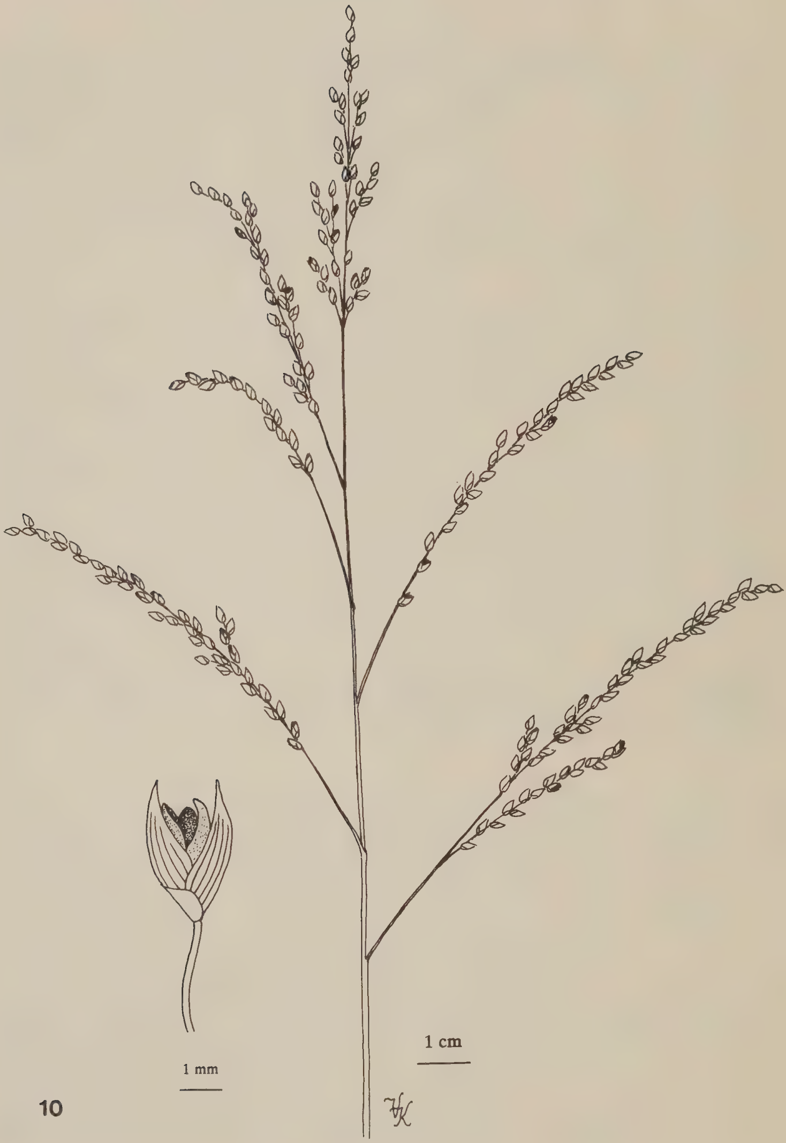

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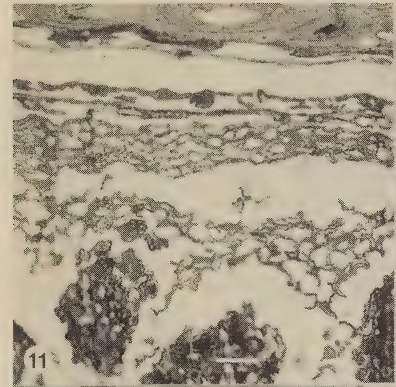
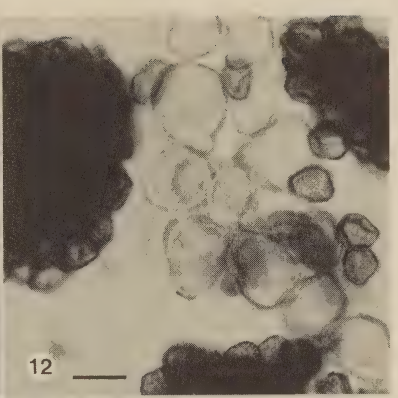
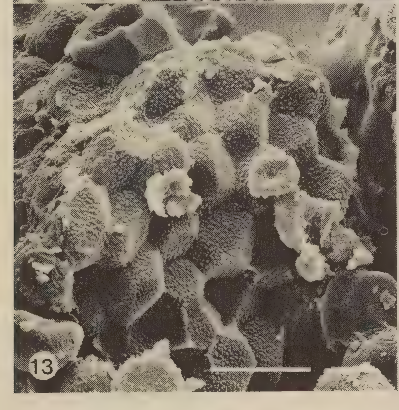
Fig. 10. Sori of Macalpinomyces sharmae K. Vánky in some of the ovaries of Panicum sumatrense (type). Enlarged, a spikelet with a sorus.







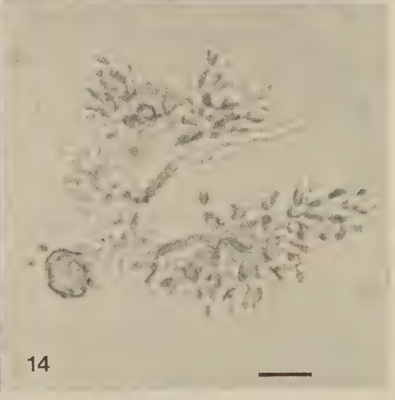


Fig. 11. T. S. of a sorus of Macalpinomyces sharmae (type) showing part of the peridium composed of an external layer of host origin, and an internal layer of fungus origin in which the spore balls are differentiating. Bar = 20 µm.

Fig. 12. Spore balls, spores and sterile cells of M. sharmae in LM. Bar = 10 µm.

Fig. 13. A broken spore ball and some sterile cells around the spore ball of M. sharmae (type) in SEM. Bar = 10 µm.

Fig. 14. Spore germination of M. sharmae (type). Bar = 10 µm.

It can easily explained that Macalpinomyces sharmae parasitizes both Panicum and Setaria by the close relationship between these two host genera. Another smut, which cannot be confused with any other species, Conidiosporomyces ayresii (Berk.) K. Vánky, also parasitizes different species of Panicum and Setaria. (Parasites as "host taxonomists"!).

Key to the known species of Macalpinomyces.

– Spores 10–19 µm long, smooth. On Eriachne . . . . M. eriachnes
– Spores 7–11 µm long, verruculose. On Panicum and Setaria . . . . . M. sharmae

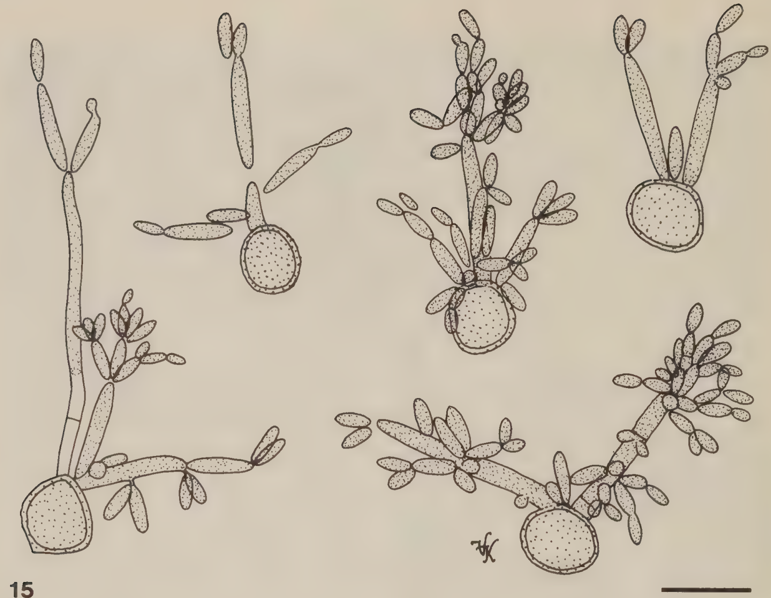


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Fig. 15. Germinating spores of Macalpinomyces sharmae (type). Bar = 10 µm.

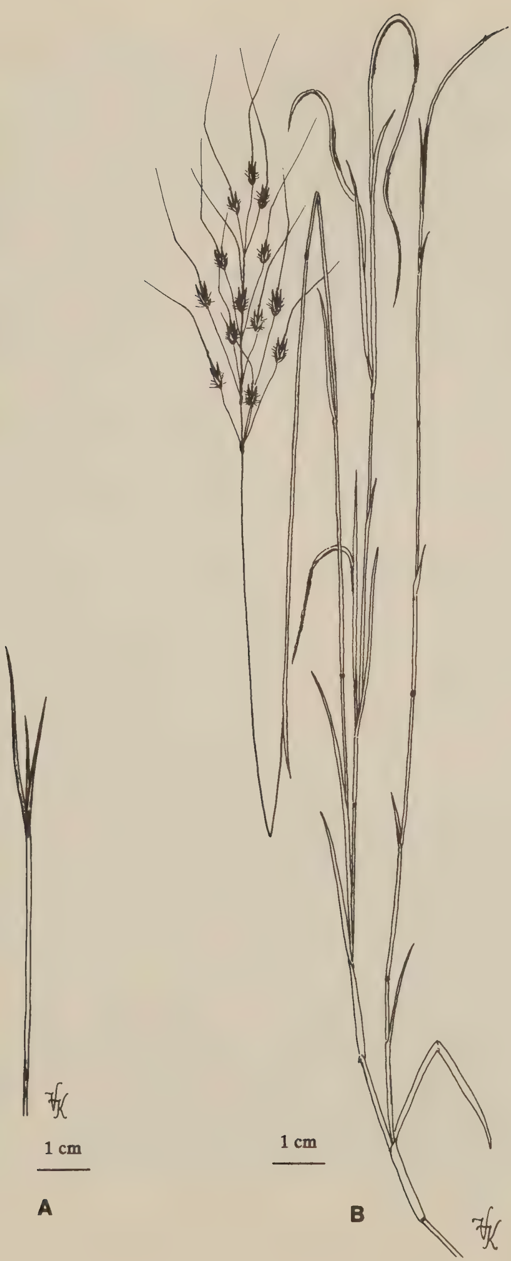
The smut fungi of Capillipedium (Gramineae).

Trying to identify a recently collected smut from India on Capillipedium huegelii (Hack.) A. Camus, I checked the four described smut species on this host genus: Sporisorium capillipedii (Ling) L. Guo, Sphacelotheca mysorensis Pavgi & Thirumalachar, Sphacelotheca pakistanica Ahmad, and Sorosporium capillipedii Mishra. Spores of Sphacelotheca pakistanica turned out to be identical with Those of Sporisorium capillipedii. Sphacelotheca mysorensis belongs to the genus Sporisorium, while Sorosporium capillipedii shows characters different from those of Sorosporium, Sporisorium or Ustilago. Unexpectedly, it turned out to be identical with another recently collected smut from India on Chrysopogon fulvus, for which I propose a new genus:

Endosporisorium K. Vánky, **gen. nov.**

Sori in interiore culmorum sive florum Graminearum, transformantes culmos sive flores in tubos cum massa atra, pulverea glomerulorum sporarum laxorum, cito dissolutorum et acervis irregularibus intermixtis sporarum sterilium impletos. Peridium fungale et columella absentes. Sporae mediocriter magnae, coloratae, ornatae, in statu maturo solitariae. Cellulae steriles hyalinae, leves. Germinatio sporarum secundum typum "Ustilago".

Fig. 16. Sori of Endosporisorium capillipedii (J. N. Mishra) K. Vánky in the distal part of the shoots of A. Capillipedium parviflorum (type), and B. Chrysopogon fulvus. One shoot escaped infection and is flowering (HUV 15745).



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Sori in the interior of the stems or flores of Gramineae transforming them into tubes filled by a dark, powdery mass of loose, early disintegrating spore balls intermixed with irregular groups of sterile cells. Fungal peridium and columella lacking. Spores medium-sized, pigmented, ornamented, when mature solitary. Sterile cells hyaline, smooth. Spore germination of Ustilago-type.

Typus generis: Endosporisorium capillipedii (Mishra) K. Vánky.

Endosporisorium differs from Ustilago (Persoon) Roussel in possessing groups of sterile cells intermixed with the spores, and in forming loose spore balls when the spores are young. Endosporisorium differs from Sporisorium Ehrenberg ex Link in having "internal" sori, within the host tissues, lacking peridium and columella. The sori of Endosporisorium are restricted to the stems. Those of Sporisorium are usually in the flowers, spikelets or in the whole inflorescence, only rarely extending to the stems, in this case the sori are "external", covered by a fungal peridium and occasionally by leaf sheaths. For Sporisorium the following characters are typical: the presence of a more or less well-developed fungal peridium, one or several columellae of host origin and sterile cells (not always present) between the more or less permanent spore balls. In Sorosporium Rudolphi the spore balls, which differ from those of Sporisorium, are rather permanent, sterile cells, peridium and columella are lacking. While species of Endosporisorium and Sporisorium parasitize members of the Gramineae family, Sorosporium does not occur on this host family; the reported Sorosporium species on Gramineae belong to other fungi.

Endosporisorium capillipedii (J. N. Mishra) K. Vánky, **comb. nov.**

Basionym: Sorosporium capillipedii J. N. Mishra, Mycologia 49:257, 1957. – Type on Capillipedium parviflorum (R. Br.) Stapf, India, Bihar, Hazaribagh, 10.X.1955, J. N. Mishra (BPI 179479!).

Sori (Figs. 16 A, B) comprise the distal part of the stems transforming them into 3–16 cm long, ca. 1 mm wide, whitish, straight or whip-like, twisted, sometimes looped tubes which split longitudinally liberating the blackish-brown, powdery mass of disintegrated spore balls intermixed with irregular groups of sterile cells. Usually all shoots of a plant are transformed into sori and infected plants do not flower. Peridium and columella lacking (Fig. 17). Spore balls loose, evanescent, globose, ovoid to irregular, 30–80 x 50–100 µm, composed of many spores. Spores (Figs. 18, 19) when mature single, subpolyhedrally globoid, ovoid or irregular, 8–10.5 x 8–11 µm, medium reddish-brown; wall thin (0.5–0.8 µm), densely echinulate, spines short (0.3–0.4 µm) just affecting the spore profile which appears undulate or serrulate, in SEM surface provided with short, conical spines. Sterile cells (Fig. 18) variable in form and size, subglobose, ellipsoidal or subpolyhedrally irregular, 4–9(–13) x 5–11(–15) µm, hyaline, usually forming irregular groups; wall thin (ca. 0.5 µm), smooth, content hyaline. Spore germination (of spores from Chrysopogon fulvus, on water agar, at room

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Fig. 17. T.S. through the basal part of a sorus of Endosporisorium capillipedii on Chrysopogon fulvus, showing the central mass of spores surrounded by host tissue permeated by hyphae. Note the lack of chloroplasts in the host cells, the cause of the white colour of the sori. Bar = 25 µm.

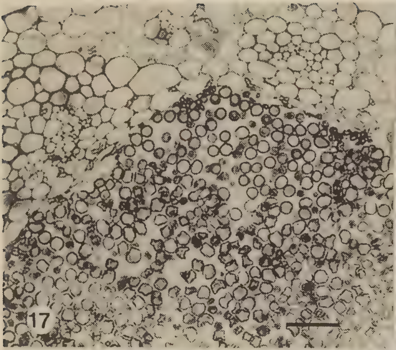
Fig. 18. Spores and sterile cells of E. capillipedii from Chrysopogon fulvus in LM (HUV 15745). Bar = 10 µm.

Fig. 19. Spores of Endosporisorium capillipedii from Chrysopogon fulvus in SEM (HUV 15745). Bar = 5 µm.

Fig. 20. Spore germination of E. capillipedii from Chrysopogon fulvus (HUV 15745). Bar = 20 µm.

Fig. 21. Spores and sterile cells of Tilletia dactyloctenii (type) in LM. Bar = 10 µm.

Fig. 22. Spores of T. dactyloctenii (type) in SEM. Bar = 10 µm.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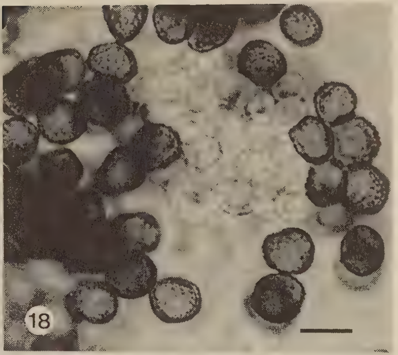
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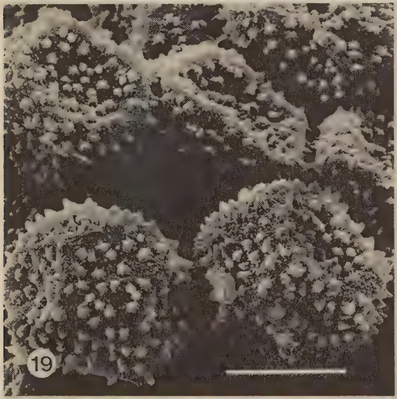
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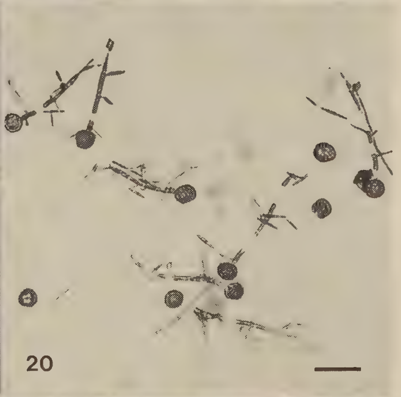
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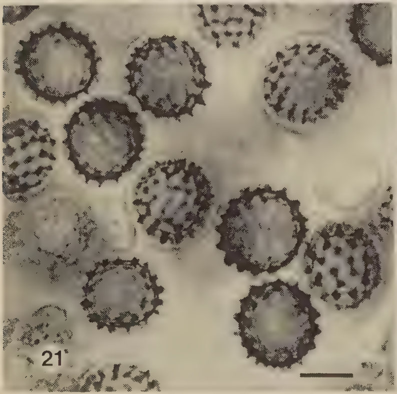
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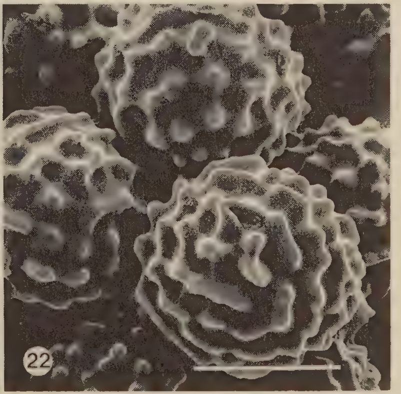
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temperature, after one day; Figs. 20, 23) results in one, rarely two, (2–)4-celled basidia measuring 2–2.5 x 25–55 µm. Basidial cells may conjugate or not, giving rise to lateral and terminal basidiospores borne on 1.5–6.5 µm long sterigmata, or to hyphae. Often both basidiospores and hyphae are produced on the same basidium. Basidiospores ovoid to long ellipsoidal, 1.5–2.5 x 4–11 µm, germinate as yeasts or by hyphae.

On Gramineae: Capillipedium parviflorum (R. Br.) Stapf, India (type), and Chrysopogon fulvus (Spreng.) Chiov., India, Maharashtra State, Pune (Poona), 22.X.1992, leg. C. & K. Vánky (HUV 15745), also in Vánky, Ustilaginales exsiccata (inedited).

In the original description (Mishra, 1957:257), the spores measure 6–9 µm in diam., and the spore wall is "almost smooth to roughened". The description of the species given above is based on a study of the type specimen, and also on the sample on Chrysopogon fulvus. Apart from the sorus measurements, which are shorter in the type specimen (3–6 cm) and longer on Chrysopogon fulvus (5–16 cm), depending certainly on the different host plants, I could find no differences in the morphology of the sori, spores and sterile cells of these two samples. In both specimens the host tissues enveloping the sori are white because of the lack of chloroplasts in these cells, an effect of the infection.

Both Capillipedium Stapf and Chrysopogon Trin. belong to the subtribe Sorghinae Bluff within the tribe Andropogoneae (Clayton & Renvoize, 1986).

Sporisorium capillipedii (L. Ling) L. Guo, 1990:78.

Sphacelotheca capillipedii Ling, 1945:8. – Type on Capillipedium parviflorum (R. Br.) Stapf, China, Szechwan Prov., Chengtu, 11.XI.1938, L. Ling. Topotypes: 5.X.1939, L. Ling (BPI 177299!), 5.II.1940, L. Ling (BPI 195086!), XI.1947, K. R. Lin (BPI 177298!).

Sphacelotheca pakistanica Ahmad, 1956:7. – Type on Capillipedium parviflorum (R. Br.) Stapf, Pakistan, Murree, VIII.1952, S. Ahmad (HUV 7245!).

Sori destroying the whole inflorescence, or only branches of an inflorescence, linear, 2–7 cm long, first concealed by the terminal leaf sheath, later protruding, covered by a brown membrane; spore mass dark brown, somewhat agglutinated, surrounding a central columella. Spores globose, subglobose to ellipsoidal, 7.5–10 x 8–11.5 µm, yellowish-brown, finely verruculose. Sterile cells in groups or in chains, globose to angular, 5.5–10 x 6–11 µm, hyaline, smooth.

The study of the isotypes of Sphacelotheca pakistanica and S. capillipedii could not reveal any difference in the shape, size, colour and ornamentation of the spores and sterile cells. The differences in the shape and size of the sori and columellae, in my opinion, do not justify to keep them as separate species.

Sporisorium mysorense (Pavgi & Thirumalachar) K. Vánky, **comb. nov.**

Basionym: Sphacelotheca mysorensis M. S. Pavgi & M. J. Thirumalachar, in Thirumalachar & Pavgi, Sydowia 6:394, 1952. – Type on Capillipedium huegelii (Hack.) A. Camus, India, Mysore, Shimoga Distr., at Bedur, V.1951, B. P. Lingappa (HCIO 20130!).

Sori in the ovaries, cylindrical, ca. 1 x 2–4 mm, covered by a thick, light brown membrane which ruptures and opens from its apex like a tulip, disclosing the blackish-brown, first agglutinated, later powdery mass of spore balls and spores intermixed with sterile cells, and a central, simple, rarely shortly ramified columella. Spore balls loose, many-spored, early breaking into single spores. Spores subglobose, ellipsoidal, usually subpolyhedrally irregular, 9.5–12 x 10.5–13.5 µm, olivaceous-brown with 4–6 lighter, rounded areas where the ca. 1 µm thick wall is thinner and often collapsed when the spores are dried; wall apparently smooth to very finely and densely punctate. Sterile cells in irregular groups, collapsed in old specimens, globose, subglobose, ellipsoidal or flattened on one or two sides, 6.5–15 µm in diam., pale yellow; wall thin (ca. 0.5 µm), even, smooth.

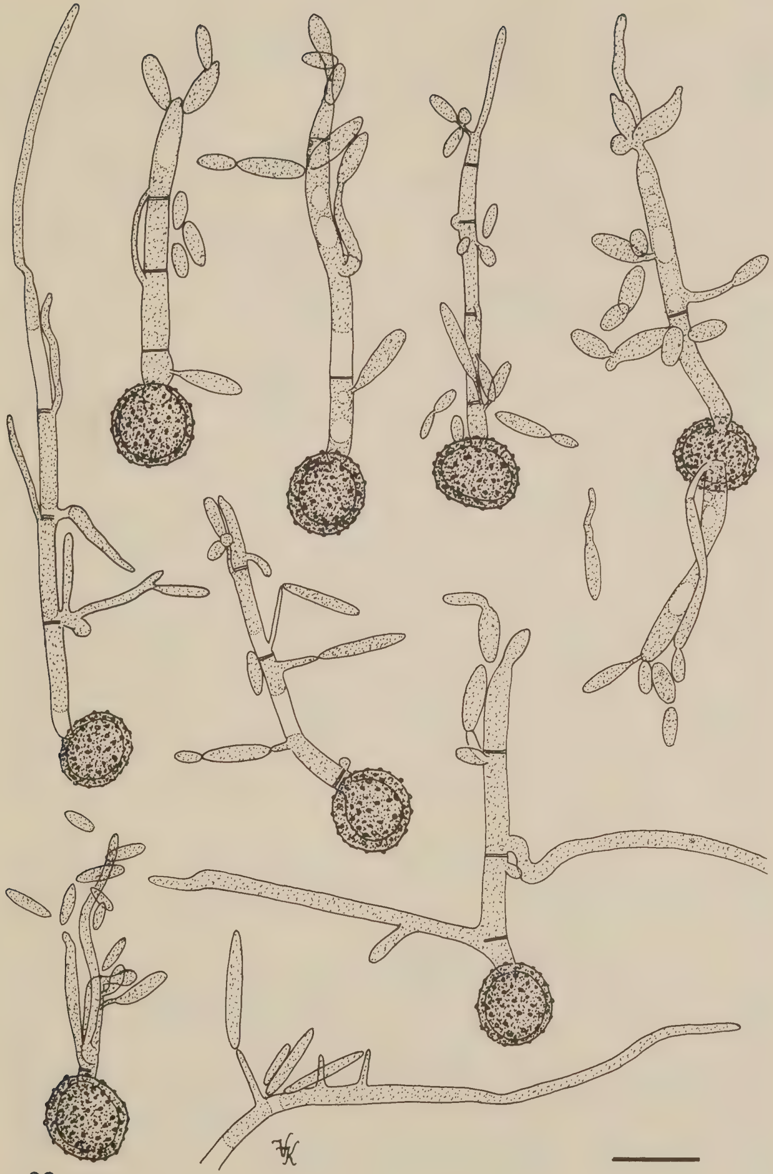

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Fig. 23. Germinating spores of Endosporisorium capillipedii from Chrysopogon fulvus (HUV 15745). Bar = 10 µm.

Key to the smut fungi of Capillipedium.

1. Sori in the interior of the stems . . . . Endosporisorium capillipedii
– Sori not so 2
2. Sori usually comprise the whole inflorescence . . . . . . Sporisorium capillipedii
– Sori restricted to the ovaries . . . . Sporisorium mysorense

Tilletia species of Dactyloctenium (Gramineae).

Only one Tilletia species has been described on Dactyloctenium: T. eleusines H. Sydow (comp. Durán & Fischer, 1961).

Tilletia eleusines H. Sydow, 1934:287.

Type on Eleusine aegyptia (L.) Desf. (= Dactyloctenium aegyptium (L.) Beauv.), India, Lahore, 1932, leg. H. Chaudhuri (HCIO 7789!).

Sori in some of the ovaries, scattered in the inflorescence, forming subglobose to ovoid, 2–3 mm long bodies covered by a fragile, olivaceous-green to brown membrane. Spore mass dark brown, pulverulent. Spores globose, subglobose to broadly ellipsoidal, 20–25 x 20–25(–28) µm, reddish-brown; wall reticulate, 4–6 meshes per spore diameter, muri 1–1.5(–2) µm high. Sterile cells subglobose to ovoid, variable in size, 8–20 µm long, hyaline to pale yellow, collapsed in old specimens; wall 1–1.5 µm thick, smooth.

In the original description (Sydow, 1934:287), the spore measurements were given as 14–24 µm and the spore wall as 2.5–3.5 µm thick. A study of the type and of a further specimen from India (Maharashtra State, Kolhapur Distr., Panhala, 2.V.1987, S. R. Yadaw; HCIO 30291) resulted in the values given above.

Durán & Fischer (1961:59) merged Tilletia setaricola Pavgi & Thirumalachar (type on Setaria intermedia Roem. & Schult., India, Varanasi) with T. eleusines. However, a comparison of the types and other samples showed that there are several differences between the smuts of these two host plants which, in my opinion, justify treating them as two species. The main differentiating characters are: In T. eleusines the sorus membrane is thin, fragil, the spore mass is dark brown, the spores are reddish-brown, 20–28 µm long, and possess 4–6 meshes per spore diameter, with 1–1.5(–2) µm high muri. In T. setaricola the sorus membrane is thick, the spore mass is blackish-brown, the spores are chocolate-brown, 17–24 µm long, and possess 4–5 meshes per spore diameter, with 1.5–2(–2.5) µm high muri.

Revising some specimens collected in India, I found that a Tilletia on Dactyloctenium aegyptium is different, not only from T. eleusines H. Sydow, but also from all known Tilletia species.

Tilletia dactyloctenii K. Vánky, **sp. nov.**

Typus in matrice Dactyloctenium aegyptium (L.) Beauv., India, Tamil Nadu, Mt. Palmi Hills in West Gates Mts, E. pag. Periyakulam, 10°8' N, 77°35' E, alt. ca. 300 m, 28.I.1980, leg. K. Vánky. Holotypus in Herbario Ustil. Vánky (HUV 8887!), isotypus in BPI.

Sori (Fig. 24) in ovariis nonnullis, in inflorescentiis sparsis, partibus tegumenti floralis perfecte absconditi, membrana tenui, faciliter dissoluta obtecti, massam sporarum atrobrunneam, semiagglutinatam, cum cellulis sterilibus intermixtam ostendentes. Fungum praesentem massae sporarum atrobrunneae ad et inter spiculas conspicuae demonstrantes. Sporae (Fig. 21, 22) globosae, subglobosae usque late ellipsoideae, 16–19 x 16–21 µm, transitu fumido flavobrunneae, ornamento spinarum acutarum, raro subacutarum cum muris tenuiter perfectis, exemplum reticulatum peculiare formantibus connectarum; spinae 1,5–2 µm altae. Cellulae steriles parvae, 8–16 µm longae, plerumque forma irregulares, hyalinae; pariete 2,5–7 µm crasso, laminato, levi.

Sori (Fig. 24) in some of the ovaries, scattered in the inflorescence, completely hidden by the floral envelopes, covered by a thin membrane which easily ruptures disclosing the dark brown, semiagglutinated mass of spores intermixed with sterile cells. The presence of the fungus is revealed by the dark brown spore masses between and on the spikelets. Spores (Figs. 21, 22) globose, subglobose to broadly ellipsoidal, 16–19 x 16–21 µm, smoky tinted yellowish-brown, ornamented with acute, rarely subacute spines connected with weakly developed muri resulting in a peculiarly reticulated pattern; spines 1.5–2 µm high. Sterile cells small, 8–16 µm long, usually irregular, hyaline; wall 2.5–7 µm thick, laminate, smooth.

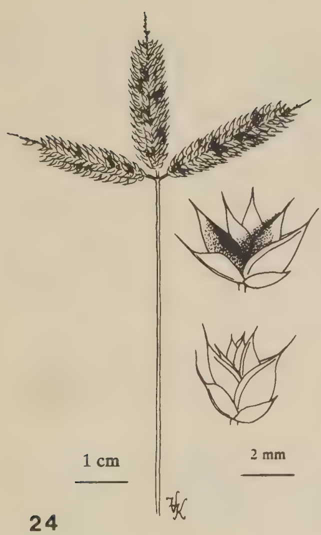

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Fig. 24. *Tilletia dactyloctenii* K. Vánky on *Dactyloctenium aegyptium* (type). Enlarged, an infected and a healthy spikelet.

Key to the *Tilletia* species of *Dactyloctenium*.

- Spores reticulate with well-developed muri . . . . *T. eleusines*
- Spores echinulate-reticulate with weakly-developed muri . . . *T. dactyloctenii*

The smut fungi of *Coix* (Gramineae).

To identify some smut fungi, recently collected in India on *Coix*, I revised the published six smuts on this host genus. Four species could be recognized:

1. **Ustilago coicis** Brefeld, 1895:110. – Type on *Coix lacryma-jobi* L., India, Simla, II.1891, comm. Barclay (BPI 159650!).

Sori both in ovaries and in male flowers, swollen, globoid, 5–10 mm in diameter. Spore mass dark brown, pulverulent. Spores globose to ellipsoidal, 7–10.5 x 8.5–12 µm, olivaceous-brown, sparsely, evidently echinulate.

2. **Franzpetrakia okudairae** (Miyabe) L. Guo, K. Vánky & J. E. M. Mordue, 1990:65. – *Ustilago okudairae* Miyabe, in S. Ito, 1935:88. – *Tilletia okudairae* (Miyabe) Ling, 1953:308. – Type on *Coix agrestis* Lour. (= *C. lacryma-jobi* L.), Japan, Iyo Prov., Okada, IX.1901, K. Okudaira (SAPA!).

Tilletia tayana Mundkur, 1940:328. – Type on *Coix agrestis* Lour. (= *C. lacryma-jobi* L.), China, Yunnan Prov., Kunming, 20.XI.1938, T. H. Wang (4259; HMAS 259; HUV 12009!).

Sori in the whole inflorescence surrounding a central, ramified columella, the remains of the floral axis. Spore mass blackish-brown, pulverulent, densely intermixed with radially arranged, slender, fragile, long chains of fungal cells. Spores globose, ovoid or ellipsoidal, 9.5–15 x 10–16 µm, chestnut-brown, reticulate, often incompletely so. Meshes variable in size and form, (2–)3–4(–5) per spore diameter, muri 1.5–2.5 µm high, narrow.

3. **Tilletia sumatii** (S. D. Patil & R. V. Gandhe) K. Vánky, **comb. nov.** Basionym: Neovossia sumatii S. D. Patil & R. V. Gandhe, Maharashtra Vidnyan Mandir Patrika 12:46, 1977. – Type on Coix lacryma-jobi L., India, Maharashtra State, ca. 30 km S. Pune, Mt. Sinhagad, 5.XII.1975, R. V. Gandhe (HUV 15456!); topotype in Vánky, Ustilaginales exsiccata no. 838 (sub Neovossia sumatii).

Sori in considerably swollen ovaries, first each is protected by the for Coix so typical white, beadlike, hard, much modified sheathing bract with an apical orifice. Later, these rupture to expose the globoid, brownish- or violet-black, compact sori, at maturity with a rounded aperture on their apex through which the black, powdery mass of spores intermixed with sterile cells is dispersed. Spores globose to subglobose, 18–26 x 20–28(–35) µm, light to dark chocolate-brown, opaque; wall 2–6.5 µm thick (incl. ornamentation), densely, finely high tuberculate. Spores sometimes with narrow, shorter or longer, hyaline appendages. Sterile cells variable in shape and size, globose to ellipsoidal, 13–33 µm long, hyaline, with smooth, 2–8 µm thick wall.

For comments about the generic delimitation between Tilletia L.-R. & C. Tul. and Neovossia Körn. see the next number of this series of papers (Vánky, Taxonomical studies on Ustilaginales. XIII; in preparation).

4. **Sporisorium lacrymae-jobi** (Mundkur) K. Vánky, **comb. nov.** Basionym: Ustilago lacrymae-jobi Mundkur (as "Lachrymae-Jobi"), Trans. Brit. Mycol. Soc. 24:327, 1940. – Type on Coix lacryma-jobi L., India, Gujarat, Junagadh, Girnar Hills, 19.IX.1913, S. L. Ajrekar (HCIO 7510!).

Sphacelotheca sinhagadensis R. V. Gandhe, 1978:57 (invalidly published, Article 29 of the ICBN). – On Coix lacryma-jobi L., India, Maharashtra State, ca. 30 km S. Pune, Mt. Sinhagad, 1.XII.1975, R. V. Gandhe (HCIO 33474!).

Sori in both male and female flowers, more or less destroying them, first covered by a thick, brown, fungal peridium which ruptures irregularly to reveal the dark brown, powdery mass of loose spore balls, spores, groups of sterile cells and an irregularly branched, central columella of host origin. Spores subglobose, ellipsoidal, usually subpolyhedrally irregular, 7–11 x 8.5–13 µm, those from the periphery of the balls light reddish-brown, finely, densely punctate-echinulate; inner spores lighter, polyhedrally irregular, apparently smooth. Sterile cells variable in shape and size, subglobose, hemiglobose, subcuneate or irregular, 6–25 µm long, hyaline to pale yellow, wall thin (0.5–1 µm), even, smooth.

Ustilago lacrymae-jobi was described by Mundkur (1940:327) as having sori in the ovaries, and smooth spores. However, the type specimen in New Delhi (HCIO 7510!) contains young sori also in the male flowers (similar to "Sphacelotheca sinhagadensis") and the spores from the periphery of the loose spore balls are finely and densely punctate-echinulate. Differences in spore morphology between Ustilago lacrymae-jobi and "Sphacelotheca sinhagadensis" mentioned (but not precisized) by Gandhe (1978:59) can be explained by the immaturity of the spores in the type specimen of U. lacrymae-jobi.

Key to the smut fungi of Coix.

1. Sori with numerous, long, slender, fragile chains of sterile
fungal cells. Spores reticulate .... Franzpetrakia okudairae
– Sori without chains of sterile fungal cells. Spores not reticulate 2
2. Spore mass black. Spores 20–28 µm long, tuberculate .... Tilletia sumatii
– Spore mass dark brown. Spores 8–13 µm long, echinulate 3
3. Spores in loose spore balls mixed with sterile cells. Spores
densely punctate-echinulate .... Sporisorium lacrymae-jobi
– Spores not in spore balls. No sterile cells. Spores sparsely,
evidently echinulate .... Ustilago coicis

The smut fungi of Isachne (Gramineae).

Two smut fungi are known on Isachne:

1. **Sporisorium isachnes** (H. & P. Sydow) K. Vánky, in Vánky & Guo, 1987:230. Ustilago isachnes H. & P. Sydow, 1912:77. – Sphacelotheca isachnes (H. & P. Sydow) Ling, 1949:263. – Sphacelotheca isachnes (H. & P. Sydow) Zundel, 1953:95 (later homonym) – Type on Isachne minutula Kunth, Philippine I., near Manila, X.1910, E. D. Merrill (7371).

Sori in the whole inflorescence, partly hidden by the upper leaf sheath, linear, 1–1.5 mm x 0.5–3(–4) cm, first covered by a light brown fungal peridium which flakes away disclosing the dark brown, powdery mass of spores intermixed with sterile cells. Spores when mature solitary, globose, subglobose to ellipsoidal or slightly irregular, 9.5–13 x 10.5–14(–16) µm, reddish-brown; wall uniformly, ca. 1 µm thick, minutely echinulate. Sterile cells in irregular groups, collapsed in old specimens. On Isachne dispar Trin., I. globosa (Thunb.) O. Kuntze, I. miliacea Roth ex Roem. & Schult., I. minutula Kunth, S. E. Asia, Indonesia.

2. **Sporisorium monakai** (J. N. Mishra) K. Vánky, **comb. nov.**

Basionym: Sphacelotheca monakai Mishra, Mycologia 48:406, 1956. – Type on Isachne dispar Trin., India, Bihar, Netarhat, 25.XI.1954, J. N. Mishra (HCIO 25276!).

Sori in ovaries, ovoid to cylindrical, 1–1.5 mm wide, first covered by a thick, light brown fungal peridium which ruptures early disclosing the dark brown, semiagglutinated to powdery mass of loose spore balls, spores, sterile cells and a well-developed, 2–8 mm long, central columella. Spore balls many-spored, irregular, easily disintegrating. Spores subglobose, ovoid, ellipsoidal to subpolyhedrally irregular, 8–10.5 x 9–13.5 µm, pale reddish-brown; wall uniformly ca. 0.8 µm thick, evidently, moderately densely echinulate. Sterile cells in irregular groups or chains, subglobose, subcylindrical or irregular, smaller than the spores (4–9 µm long), thin-walled (ca. 0.5 µm), hyaline. On Isachne dispar Trin., I. globosa (Thunb.) O. Kuntze, S. E. Asia.

Key to the smut fungi of Isachne.

– Sori in the inflorescence. Spores 10.5–16 µm long . . . . S. isachnes
– Sori in the ovaries. Spores 9–13.5 µm long . . . . S. monakai

NEW COMBINATIONS

Endosporisorium loudetiae (Viennot-Bourgin) K. Vánky, **comb. nov.**

Basionym: Sorosporium loudetiae Viennot-Bourgin, Rev. Mycol., Suppl. Colon. 16:104, 1951; Ann. Épiphyt. 2:468, 1951a. – Type on Loudetia sp. (cf. arundinacea (Hochst ex A. Rich.) Steud., teste Vánky), Cameroun, Ngdéré near Meiganga, VI.1939, coll. Jaques-Félix (PC!).

Sori comprise the central part of the spikelets transforming them into 4–6 cm long, 0.6–0.8 mm wide, whitish or pale yellowish-brown, acute, hairy tubes filled with spores intermixed with sterile cells. Fungal peridium and columella are lacking. At maturity, the straight or bent sori split longitudinally, becoming looped or spirally twisted, liberating the black-brown, powdery mass of easily disintegrating spore balls and the sterile cells. All spikelets of a panicle are transformed into sori, only the two glumes (sometimes only the first one, sometimes even the lower lemma) remain more or less intact. Other floral parts are not or only rudimentarily developed as more or less aborted stamens or as short, acute, scale-like or tubular, adpressed branches, arising from different levels of the soral tube. A thin, sporogenous fungal layer covers the inner surface of the soral tubes, evident especially on the proximal, still unripe part of the sori. Spore balls loose, many-spored, subglobose, ellipsoidal or slightly irregular, 30–70 x 35–95 µm, dark reddish-brown. Spores subglobose, ovoid, usually subpolyhedrally or polyhedrally irregular, 6.5–9.5 x 8–11 µm, reddish-brown; wall uniform, thin (ca. 0.5 µm), apparently smooth to finely and densely punctate. Sterile cells subglobose, ovoid to slightly irregular, 8–13 µm long, hyaline, smooth, aggregated in loose, irregular groups or solitary, collapsed in old specimes.

Viennot-Bourgin (1951, 1951a) did not mention the presence of sterile cells of Sorosporium loudetiae. He found it difficult to estabilish the generic position of this species. Endosporisorium loudetiae is the second known species of Endosporisorium. Apart from the type specimen, it is known from several collections on Loudetia arundinacea (Hochst ex A. Rich.) Steud., from Zaire (BR, HUV 16376-379).

By courtesy of Dr. R. Berndt, I obtained some smutted samples of a Rhynchospora, recently collected from Venezuela. The host is R. glauca Vahl, and the smut fungus is identical with the type of Cintractia standleyana. A study of the sori, spores and spore germination showed that this fungus is not a Cintractia. It is close to the Ustilago rhynchosporae group.

Ustilago standleyana (Zundel) K. Vánky, **comb. nov.**

Basionym: Cintractia standleyana Zundel, Mycologia 35:171, 1943. – Type on Rhynchospora glauca Vahl, Guatemala, Dept. Alta Verapaz, large swamp east of Tactic, alt. ca. 1450 m, 14.IV.1941, P. C. Standley (BPI 141633! & 172151!).

U. standleyana produces globoid witches' brooms in the inflorescence measuring 0.5–1 cm in diameter, composed of densely packed, infected flowers. Sori destroy the inner part of the flowers; only the slightly deformed glumes which enclose the black, powdery mass of spores remain intact. Spores slightly flattened, in plane view circular, subcircular to elliptic, in side view elliptic, semicircular or reniform, with a well-developed "hyphal fragment" on the flattened side, 11–16 x 13.5–17.5 µm, dark reddish-brown; wall 1.5–3 µm thick, thinner on the flattened side (0.7–1 µm), finely and densely foveolate, in LM giving a reticulate appearence. Germination (on water agar, after 3 days, at room temperature; Fig. 25) results in septate basidia. The basidial cells separate easily continuing to produce, mostly apically, ovoid to long ellipsoidal basidiospores measuring 2–3 x 5–13 µm.

Ustilago standleyana differs from U. rhynchosporae Sauter (type on Rhynchospora alba (L.) Vahl, Austria) in producing witches' brooms, in having darker, thick-walled spores provided with well-developed "hyphal fragments". U. rhynchosporae does not produce witches' brooms, the spores are lighter, with thinner wall (1–1.5 µm), lacking "hyphal fragments". Both U. intercedens Lehtola (type on R. alba (L.) Vahl, France) and U. montagnei (type on R. glauca Vahl, Algeria) have smaller, irregular, often angular, thin-walled spores.

U. standleyana is only known on Rhynchospora glauca Vahl, from the type collection in Guatemala, and from the recent collection in Venezuela, Estado Bolivar, at the "La Escalera"-section of the Gran Sabana Highway, ca. 10 km S. of the "piedra de la virgen", 2.I.1994, R. Berndt (HUV 16065).

For discussion about the generic position of this group of smut fungi see Vánky (1994:17).

EXCLUDED SPECIES

Kundalkar & Patil (1983:521) described Sorosporium marina from the leaves of Halophila beccarii Ascherson, a marine member of the Hydrocharitaceae family, an unusual host plant for Ustilaginales. M. S. Patil (in litt.) drew my attention to the fact that Sorosporium marina is a synonym of Plasmodiophora halophilae Karling (Plasmodiophorales).

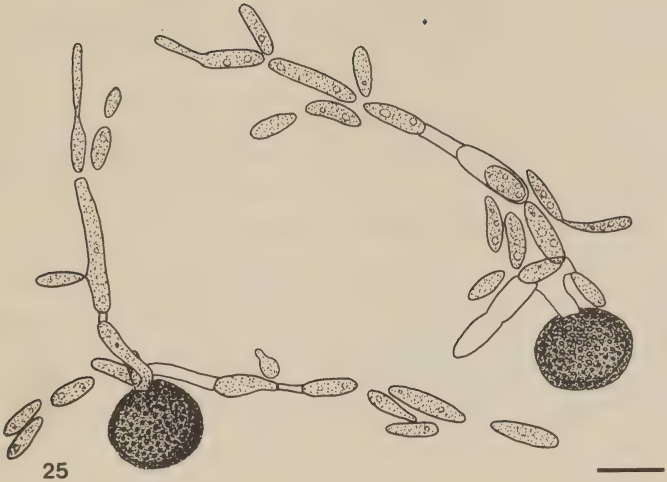

Fig. 25. Germinating spores of Ustilago standleyana from Rhynchospora glauca (HUV 16065). Bar = 10 µm.

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CHANGES IN LYOPHILIZED CULTURES OF ASPERGILLI AND PENICILLIA

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Abstract: Lyophilized cultures of *Aspergillus* and *Penicillium* stored for more than thirty five years were examined for characters of taxonomic importance. There were only few variations recorded in microscopic characters e.g. size and shape of sterigmata, conidia etc. but a marked variation in many cases in the characteristic exudates from the colonies and the soluble pigments in agar plates.

INTRODUCTION

Lyophilization technique has proved to be a most convenient and successful method of preserving sporulating fungi. It has been in regular use since Raper and Alexander (1945) reported good survivals for fungi at the Northern Regional Research Laboratory, Peoria, Il. (USA). Cultures of Aspergilli and Penicillia, most of them brought by Prof. B.S. Mehrotra, from NRRL Culture Collection, Peoria, IL (USA), way back in 1957 and others were lyophilized at the same time in India. In India they were stored under fluctuating temperatures first in a refrigerator in the tropical climate of Allahabad (at the time of power failure and brief breakdowns of the refrigerator, the temperature may have varied from 20 to 48 °C)and then in a steel cabinet (temperature ranging from 2 to 30 °C) in the sub temperate climate of Nainital (Mehrotra, 1985). In the present report cultures developed from those lyophilized tubes were examined with respect to characters of taxonomic importance.

MATERIALS AND METHODS

The cultures were grown in the media of the same composition (Czapek's Dox Agar and Czapek Yeast Autolysate Agar) as were used for the studies reported in Raper and Fennell's (1977) and Pitt's (1979) manuals of Aspergilli and Penicillia, respectively. The cultures were incubated at 25 °C and 37 °C temperatures for 7 days. In some cases the incubation period was increased up to several weeks to observe the formation of sclerotia, cleistothecia, etc. as per requirement. Morphological and microscopic characteristics were compared to the characters given in manuals. For microscopic observations high quality compound microscope equipped with objectives in range of 10X to 100X oil immersion was used.

RESULTS

Almost all (98%) of the cultures revived and sporulated well on media. It is clear from the taxonomic studies that there were little variations in microscopic characters, while there were marked variation in many cases in the characteristic exudates from the colonies and the soluble pigments in the agar plates. A list of principal differences noted from the type description given in the manuals is given below in Table I for the sake of brevity.

Table I

	Name of fungus and NRRL No.	Characters in the manual	Differences in our cultures
1.	*Penicillium atramentosum* 795	Exudates sometimes present	Never present
		Soluble pigment typically present	Totally absent
		Conidial shape spheroidal to subspheroidal	Spheroidal only
2.	*P. allahabadense** (*P. pinophilum*)	Texture loose and floccose	Very floccose at center only
		Mycelia white at margins	Yellow at margin
		Exudate clear to red	Pale red
		Conidia subspheroidal	Spherical to ellipsoidal
3.	*P. capsulatum* 2056	Surface texture radially not sulcate	Sulcate
		Central area depressed	Floccose
		Mycelium white to pale yellow	White
		Soluble pigments sometimes present	Always absent
		Conidia ellipsoidal, cylindroidal or pyriform, 3-4µm(-6µm)	Ellipsoidal 2-3.5 µm
4.	*P. carneolutescens* (*P. hirsutum*) 2035	Conidiogenesis in green shades	Not green
		Exudate violet brown, near maroon	Colorless
		Soluble pigment typically present	Totally absent
5.	*P. casei* (*P. roquefortii*) 844	Reverse pale, green to deep blue green, almost black	Golden brown
6.	*P. corylophilum* 802	Exudate sometimes present	Never present
		Conidia spherical to subspheroidal	Typically spherical
7.	*P. corymbiferum* (*P. hirsutum*) 2032	Colony texture granular to obviously coremial	Colony centrally floccose
		Exudate violet brown	Maroon
		Soluble pigment typically present	Always absent
8.	*P. cyclopium* 942	Conidiogenesis grayish, turquoise	Blue green to dull green
		Exudate typically conspicuous at least near margins	Always absent
		Soluble pigment produced by some isolates	Absent
		Phialides of 9-10µ	10-12µ
9.	*P. cyneofulvum* (*P. griseoroseum*) 837	Exudate copious, pale, bright yellow	Limited, light yellow
		Soluble pigment usually present	Never present

10.	*P. digitatum* 786	Surface texture not velutinous	Velutinous
		Penicillus bi-as well as terverticillate	Only biverticillate
		Conidia 6-8 µm(-15µm)	3.5-6.5µm (-8µm)
11.	*P. frequentans* (*P. glabrum*) 1915	Exudate produced by some isolates	Totally absent
		Bright yellow pigment produced	Light yellow pigment after 15 days
		Reverse pale to deep orange	Yellow
12.	*P. gladioli* 939	Surface texture umbonate	Centrally floccose
		Mycelia milk white to sulphur yellow	Creamish
		Cleistothecia orange gray, buff or brown, not sclerotoid	Cleistothecia buff, sclerotoid
		Reverse pale or orange brown	Yellow
13.	*P. humuli* 872	Surface texture velutinous, somewhat floccose	Velutinous, never floccose
		Mycelia grayish orange	Buff
		Reverse pale brown	Dull yellow
14.	*P. lanosoviride* (*P. viridicatum*) 879	Exudate clear to pale yellow, pale pink	Totally absent
		Soluble pigment present	Absent
		Ter- to quaterverticillate penicilli	Mostly biverticillate
		Conidia subspheroidal to ellipsoidal, 3-4µm	Spherical to elliptical, 3-6µm
15.	*P. martensi* 956	Mycelia white	Dull yellow
		Exudate clear to pale brown	Absent
		Soluble pigment present in some isolates	Always absent
		Conidia subspheroidal to ellipsoidal	Only subspheroidal
16.	*P. meleagrinum* (*P. chrysogenum*) 836	Exudate pale to brilliant yellow	Very small droplets of clear exudate
		Bright yellow pigment characteristically produced	Totally absent
17.	*P. notatum* (*P. chrysogenum*) 821	Yellow soluble pigment characteristically produced	Totally absent
18.	*P. olivino-viride* (*P. viridicatum*) 2028	Exudate present	Absent
		Soluble pigment produced	Never produced
		Reverse orange brown, saffron to bright or deep, near brownish orange	Dull yellow green
19.	*P. oxalicum* 790	Colony texture floccose in central area	Not floccose
		Exudate limited	Totally absent
		Reverse orange brown, pink or yellow	Violet

20.	*P. palitans* (*P. viridicatum*) 966	Exudates pale yellow	Clear
		Soluble pigment always present	Never present
		Phialides 7-8(-10µm)	Up to 12µm
21.	*P. psittacinum* 932	Exudate clear to pale yellow	Absent
		Soluble pigment present	Absent
		Reverse orange brown	Dull yellow
		Conidia subspheroidal to ellipsoidal	Spherical
22.	*P. purpurogenum* 1066	Orange to red exudate occasionally present	Absent
		Soluble pigment characteristically present	Totally absent
23.	*P. pulvillorum* (*P. simplicissimum*) 2026	Clear exudate present	Absent
		Soluble pigment sometimes present	Never present
		Sclerotia occasionally produced	Never produced
		Metulae 12-20µm	6-10µm
		Phialides 7-9(-12µm)	6-9µm
		Conidia variable, ellipsoidal, spheroidal, or pyriform, mostly 2-5µm	Always spheroidal mostly 3.2µm
24.	*P. roquefortii* 849	Penicilli terverticillate, occasionally quaterverticillate	Never quaterverticillate
		Phialides 8-10µm	10-20µm
25.	*P. roseo-viride* (*P. thomii*) 760	White mycelia becoming pinkish in age	White mycelia not become pinkish in age
		Sclerotia produced in center	No sclerotia
		Exudate abundant	Totally absent
26.	*P. sclerotiorum* 2076	Colonies becoming yellow and most commonly brilliant orange near the colony center	Not so
		Exudate limited to abundant	Absent
		Soluble pigment usually present	Absent
		Reverse amber yellow or orange to coffee	Green
27.	*P. solitum* (*P. aurantiogriseum*) 937	Colony texture smooth to granular	Cottony
		Exudate typically conspicuous, at least near margins	Absent
		Soluble pigment present in some isolates	Absent
		Conidial shape subspheroidal to elliptical	Only subspheroidal
28.	*P. soppi* (*P. miczynskii*) 2023	Mycelium pastel yellow	White
		Sclerotia produced by some isolates	Absent
		Exudate pale to bright yellow	Clear
		Soluble pigment present	Absent
		Reverse vivid yellow to orange yellow	Dull yellow

29.	*P. terestre* (*P. crustosum*) 936	Exudate typically present Soluble pigment limited to absent Metulae 10-15µm Phialides 9-11µm	Totally absent Absent 9-13µm 9-12µm
30.	*P. velutinum* 2069	Dark brown soluble pigment present Penicillus sometimes appear as monoverticillate	Absent Never appear as monoverticillate
31.	*P. verruculosum* 1050	Surface texture lightly floccose Orange or reddish areas present on colony Reverse reddish brown to orange brown	Not so Not present Pale brown
32.	*Aspergillus carbonarius* 67	Colony color carbon black	Brown
33.	*A. fischeri**	Conidial heads pale blue, green Sterigmata 5.5-7µm Ascospores mostly 7µm in length	Green 3-6µm Not more than 6µm
34.	*A. nidulans* 224	Cleistothecia cream buff to honey yellow	Dull yellow gray
35.	*A. niger* 322	Conidiogenesis typically black Reverse colorless Primary sterigmata vary with the strains, In most cultures 20-30µm Secondary sterigmata 7-10µm Conidia globose, often slightly discoid, 4-5µm	Brown Pale 6.5-9µm 6-8µm Globose, 3.5-4.5µm
36.	*A. ochraceus**	Exudate often present Sclerotia often present	Absent Absent
37.	*A. phoenicis**	White basal mycelium Reverse white to slightly gray Exudate inconspicuous Sclerotia present	Light yellow mycelium Dull yellow Totally absent Absent
38.	*A. terreus* 1913	Buff to cinnamon colored heads, very rarely zinc orange Reverse yellow to brown Soluble pigment not reported Conidia globose to elliptical	Bright orange Greenish brown Yellow soluble pigment present Globose
39.	*A. terreus* 1920	Heads columnar Exudate amber colored Conidia elliptical to globose	Somewhat radial Very light yellow Only globose

40.	*A. terreus* 255	Radial furrows present Secondary sterigmata 5.5-7.5μm Conidia globose to elliptical Soluble pigment not reported	Absent 3-4μm Globose only Yellow soluble pigment present
41.	*A. terreus* var. *aureus* 1923	Colony texture floccose	Not so
42.	*A. unguis* 215	Reverse uncolored	Dull green
43.	*A. ustus**	Hulle cells present	Absent

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*The cultures are from the personal culture collection of Prof. B.S. Mehrotra

DISCUSSION

Low temperature storage of ampoules had been advocated for the longevity of the cultures and 4 °C seemed to be the best (Heckly, 1978). Earlier Mehrotra and Hesseltine (1958) had reported that lyophilized cultures stored in a refrigerator for 15 years were found to be morphologically stable. At CMI the ampoules were stored at between 15 and 20 °C and fungi survived over 15 years (Smith, 1983). Our results show that the lyophilized cultures can endure even high and fluctuating temperatures without losing their viability.

It can be concluded that lyophilization of cultures and their subsequent uncared storage for more than 35 years at room temperature does not bring material change in the morphological characters of Aspergilli and Penicillia but it does bring certain cultural changes e.g. in the production of soluble pigments and exudates or slight change in the texture of colony.

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CHECKLIST OF THE GENUS INOCYBE IN ANDALUSIA (PENINSULAR SPAIN)

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SUMMARY.

An annotated checklist to all the *Inocybe* (Fr.) Fr. species recorded or studied in Andalusia (Spain) is given. Some new, rare or interesting taxa for the Iberian Peninsula are commented on in more detail. A total of 62 taxa are listed, accompanied by chorological, ecological and, in some cases, bibliographical data. A new combination is made: ***Inocybe flocculosa* fo. *crocifolia*** (Herink) **comb. nov.**.

Key words: *Inocybe*, *Agaricales*, taxonomy, Andalusia, Spain.

RESUMEN.

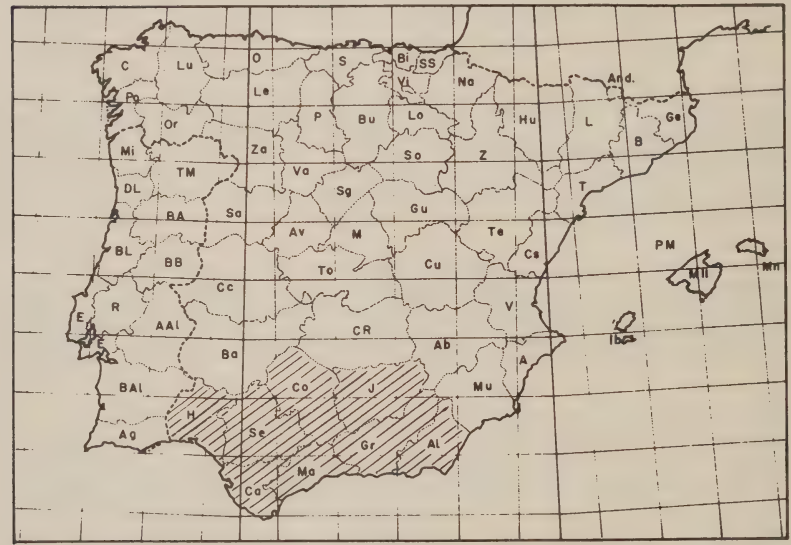
Se aporta un listado sobre los táxones citados o estudiados del género *Inocybe* (Fr.) Fr. en Andalucía (España). Aquellos táxones nuevos, raros o interesantes para la Península Ibérica son comentados más detalladamente. La lista recoge un total de 62 táxones, que incluyen referencias corológicas, ecológicas y, en algunos casos, bibliográficas. Se realiza la nueva combinación ***Inocybe flocculosa* fo. *crocifolia*** (Herink) **comb. nov.**

Palabras clave: *Inocybe*, *Agaricales*, taxonomía, Andalucía, España.

INTRODUCTION

The Andalusia region is located in the south of the Iberian Peninsula, occupying an area of about 87.000 km^2, including eight provinces (Almería, Cádiz, Córdoba, Granada, Huelva, Jaén, Málaga and Sevilla)-see map-. It shows an enormous ombroclimatic variability (five different types of ombroclimate can be identified: semiarid, dry, subhumid, humid and hyperhumid); the same applies to its thermoclimate (with five types too: thermo-, meso-, supra-, oro- and crioro-mediterranean); these factors give rise to an extremely diverse vegetation, with more than 3.000 species of vascular plants catalogued (Valdés, 1993). The Andalusian vascular flora is typically mediterranean and many species are common in northern Africa, though part of its vegetation has a different origin having reached the region through other migratorian pathways.

To understand the ecological behaviour of many ectomycorrhizal agarics in Andalusia, a short comment about the plant-communities which have been studied by us seems necessary. First, the cork-oak (*Quercus suber*) forests or "alcornocales", mainly located in western Andalusia (Cádiz, Huelva, Málaga and Sevilla), are characterized by a subhumid ombroclimate, lack of frost periods in winter and siliceous substrate, *Q. suber* being the dominant plant, accompanied by others such as *Q. canariensis*, *Q. faginea*, *Q. ilex* subsp. *ballota*, *Arbutus unedo*, *Olea europaea* var. *sylvestris*, ...etc. The evergreen oak (*Quercus ilex subsp. ballota*) forests or "encinares" are the most representative forest communities in eastern Andalusia (Granada, Jaén and Málaga), developing in areas with annual precipitations superior to 350 ml, in the thermo- and supramediterranean thermoclimatic levels, preferably on calcareous ground, being *Q. ilex subsp. ballota = Q. rotundifolia* the dominant vascular plant, accompanied by *Pistacia lentiscus, Olea europaea var. sylvestris, Quercus coccifera, Chamaerops humilis*,...or *Juniperus oxycedrus, Daphne gnidium, Ruscus aculeatus, Pistacia terebinthus*, ...etc, according to the different locations. The riparian-communities, bound to



Map —Alicante (A), Alto Alentejo (AAl), Algarve (Ag), Almería (Al), Ávila (Av), Albacete (Ab), Barcelona (B), Badajoz (Ba), Beira Alta (BA), Beira Baixa (BB), Beira Litoral (BL), Baixo Alentejo (BAl), Bilbao (Bi), Burgos (Bu), Coruña (C), Cádiz (Ca), Cáceres (Cc), Córdoba (Co), Ciudad Real (CR), Castellón (Cs), Cuenca (Cu), Duoro Litoral (DL), Estremadura (E), Gerona (Ge), Granada (Gr), Guadalajara (Gu), Huelva (H), Huesca (Hu), Ibiza (Ib), Jaén (J), Lérida (L), León (Le), Logroño (Lo), Lugo (Lu), Madrid (M), Málaga (Ma), Minho (Mi), Mallorca (Mll), Menorca (Mn), Murcia (Mu), Navarra (Na), Oviedo (O), Orense (Or), Palma de Mallorca (PM), Palencia (P), Pontevedra (Po), Ribatejo (R), Santander (S), Salamanca (Sa), Sevilla (Se), Segovia (Sg), Soria (So), San Sebastián (SS). Tarragona (T), Teruel (Te), Tras os Montes (TM), Toledo (To), Valencia (V), Valladolid (Va), Vitoria (Vi), Zaragoza (Z), Zamora (Za).

river banks, are commonly formed by caducicolous plants with mesophytous inclinations; among them we emphasize the alder (*Alnus glutinosa*) communities or "alisedas", located in the stream proximities, with more hydric requirements, and the poplar (*Populus sps.*) communities or "choperas", which thrive in commonly flooded soils. The conifer vegetal formations are mostly reafforested communities, traditionally favoured by man with exploitation purposes. The most frequently used conifer species are *Pinus pinaster*, *P. nigra subsp. salzmannii*, *P. halepensis*, *P. sylvestris* and *P. pinea*; along with them, though vestigially, some representatives of *Cedrus*, *Cupressus*, ...etc, may appear. Lastly, the *Cistus* bushes or "jarales" constitute the most extended serial stage in the southern part of the Iberian Peninsula, being more frequent in the provinces of Cádiz, Córdoba, Huelva, Jaén, Málaga and Sevilla, developing on acid and poor soils, being the most characteristic serial stage of the "alcornocales" and "encinares". The main components are *Cistus ladanifer*, *C. laurifolius*, *C. monspeliensis*, *C. populifolius*, *C. salvifolius*,...etc.

As for *Inocybe* in Andalusia, owing to this great floristic variability and the interesting convergence of northernafrican and eurosiberian elements in this region, many agaricologists have carried out mycological studies, some of them including isolate records of *Inocybe* species; among these, we can mention Varo & al. (1976), Calonge & Tellería (1980), Malençon & Llimona (1980) and Ortega & García-Buendía (1986). However, the first monographic contribution for the region was made by Ortega & Esteve-Raventós (1989), with a total of 28 records of *Inocybe* taxa. All the taxa reported in this paper are included in the subgenera *Inocybe*, *Inosperma* Kühner and *Inocybium* (Earle) Sing.; up to now, taxa belonging to the recently proposed subgenus *Leptocybe* T. Kobayashi (Kobayashi, 1993), have not been either reported or described in the Iberian Peninsula.

It is dissapointing that in some very important monographical works about *Inocybe* in Europe (*e.g.* Heim, 1931; Kuyper, 1986), the Iberian taxa belonging to this genus have not been either studied or do they receive comment; the Andalusian records can offer a wider spectrum of distributional parameters of this genus between central and northern Europe and North Africa, where many new taxa probably remain undescribed (cf. Malençon & Bertault, 1970). The aim of this check-list is to offer as much information as possible and start to fill the existent gap in the knowledge of this genus in the "often forgotten" Iberian Peninsula.

MATERIAL AND METHODS

The samples were studied under the light microscope using distilled water, KOH 5%, Congo Red 2% and NH_4OH 5%, measuring at least 20 spores from lamellae. All the material has been deposited and preserved at the herbaria of Granada (GDAC) and Alcalá de Henares, Madrid (AH).

Basically, we have followed the taxonomic treatment of Kuyper (1986) and Stangl (1989), except where indicated; also, the contributions of Malençon & Bertault (1970), where many *Inocybe* species from Morocco are studied, and Nishida (1989), which includes a practical key of the species from California are recommended, both introducing many typical species of mediterranean character.

The following list of taxa includes synonyms of common use, reference to all the material studied by us, previous records from the region and taxonomical comments in the case of rare or problematical taxa or "species complexes". We have strictly respected the taxonomic treatment of the different authors who have reported *Inocybe* records in the region, but remarks about their determination have been added in cases where the material has been preserved and revised by us.

LIST OF TAXA

Inocybe adaequata (Britz.) Sacc.
= *Inocybe jurana* (Pat.) Sacc.
= *Inocybe rhodiola* Bres.
Material studied.- CÁDIZ: Crtra de Puerto Galis a Jimena de la Frontera (Parque Natural de los Alcornocales), 11-XI-1989, *Quercus suber* forest in acid soil, GDAC 31469. Crtra de Los Barrios a Alcalá de los Gazules, 12-XI-1992, in *Quercus suber* forest in acid soil, AH 15315.
Comments.- This species seems to share the wide range of sporal dimensions exhibited by *I. rimosa s.l.* as can be demonstrated by the specimens recently described from Japan by Kobayashi (1993 b).

Inocybe albomarginata Velen.
= *Inocybe ovalispora* Kauffm.
= *Inocybe reducta* J.Lange
Material studied.- MÁLAGA: Alrededores de Coín, 9-XII-1988, under *Quercus suber* and *Cistus laurifolius* in acid soil, GDAC 33984.

Inocybe amblyspora Kühner
= *Inocybe tristis* Malenç., *s.* Kuyp.,*non* M.Bon & Contu
Material studied.- HUELVA: Coto de Doñana, under *Pinus pinea* in sandy acid soil, GDAC 23607.
Previous records.- This material (GDAC 23607) was previously recorded by Ortega & Esteve-Raventós (1989).
Comments.- Closely related to *I. albomarginata*, from which it mainly differs in somewhat bigger and narrower spores (cf. Kühner, 1955). However, this feature will have to be re-evaluated with more material, because separation between these taxa is not always clear, based on this character (Kuyper, pers. comm.). On the other hand, Bon & Contu in Contu (1993) have created *I. georgii* for the taxon with conical and not rounded spore apex (*I. tristis* Malenç., *non* Hruby), which seems to be very close to *I. pseudoreducta* Stangl & Glowinski.

Inocybe amethystina Kuyp.
= *Inocybe obscura s.* Konrad & Maubl., Bres.,*s. auct.*
Material studied.- CÁDIZ: Crtra de Alcalá de los Gazules a Puerto de Galis, 14-XI-1992, under *Alnus glutinosa* in acid soil, AH 15603. Same locality, date and habitat, AH 15604.

Inocybe asterospora Quél.
Material studied.- CÁDIZ: Sierra de la Luna (Parque Natural de los Alcornocales), 17-XI-1987, under *Quercus suber* in acid soil, GDAC 30691. Crtra de Los Barrios a Facinas (Parque Natural de los Alcornocales), 10-XI-1989, under *Quercus suber* in acid soil, GDAC 31470. MÁLAGA: Cortes de la Frontera (Parque Natural de los Alcornocales), 15-XI-1987, under *Quercus suber* in acid soil, GDAC 30692.
Previous records.- Calonge & Tellería (1980) from Laguna de Santa Olalla, Doñana (Huelva), under *Halimium halimifolium (Cistaceae)*, MA-FUNGI 326; however, this collection represents *I. calida* (see there).

Inocybe bongardii (Weinm.) Quél.
Material studied.- CÁDIZ: Pinar de San Cristóbal (Grazalema), 3-IV-1982, under *Abies pinsapo* in basic soil, GDAC 16154. GRANADA: Alhama de Granada, 26-III-1980, under *Quercus*

ilex subsp. ballota in basic soil, GDAC 10555. Alfaguara-casa forestal, under *Quercus ilex subsp. ballota* in basic soil, GDAC 10556. Sierra Elvira, 7-II-1979, under *Quercus ilex subsp. ballota* in basic soil, GDAC 10557. Same locality and habitat, 9-XI-1979, GDAC 10558. JAÉN: Mata Bejid, 27-XI-1990, under *Quercus ilex subsp. ballota* in basic soil, GDAC 36668.
Previous records.- Varo & al. (1976) from Granada, but there is no material at GDAC. Also, Anguita & al. (1992) and Jiménez & al. (1993) have catalogued this species from Jaén province, but no material has been preserved. The collections GDAC 10555, 10556, 10557 and 10558 were already recorded by us (Ortega & Esteve-Raventós, 1989).
Comments.- Together with *I. rimosa s. l.*, this is a rather common species in the Andalusian basophilous *Q. ilex subsp. ballota* forests.

Inocybe bresadolae Mass.
Material studied.- CADIZ: Crtra de Los Barrios a Facinas, 15-XI-1984, under *Quercus suber* in acid soil, GDAC 23666. Crtra Puerto Galis a Jimena de la Frontera, 13-XI-1992, under *Quercus suber* in acid soil, AH 15322.
Previous records.- The material GDAC 23666 was recorded and described by Ortega & García-Buendía (1986) without a collection number.
Comments.- The Andalusian collections show ventricose cystidia, wider than is commonly indicated in the specialized bibliography; Malençon & Bertault (1970) refer to narrow and cylindrical to fusiform cystidia, the same as in Kühner and Boursier (1928). However, in the original description by Massee (1904), the author says: " c. ventricose, 60-70 x 17-20 µ", more in conformity with our collections.

Inocybe cf. brevicystis Métrod ex Kuyp.
Material studied.- GRANADA: Parque Natural de la Sierra de Huétor, 13-XI-1987, under *Cedrus* in basic soil. GDAC 30385. Arroyo de Fardes (Parque Natural de la Sierra de Huétor), 28-XI-1989, under *Quercus ilex subsp. ballota, Q. faginea* and *Q. pyrenaica* in acid soil, GDAC 31873. MÁLAGA: Venta Garvey, crtra de Málaga a Colmenar, 18-XI-1987, under *Quercus suber* in acid soil, GDAC 37084.
Comments.- This is a little known species, having small pleurocystidia and lacking the typical smell of *I. hirtella* Bresad. For the time being, we prefer to cite the samples with a "cf." until more good descriptions about this taxon reveal constant characters, such as the presence of a bulbous stipe and the spores with rounded apex. *I. mycenoides* Kuyp. (= *I. citrinofolia* Métrod) is very close, differing in yellow lamellae, "mycenoid" habit and spores with (sub)acute apex. Our collection GDAC 37084 shows spores with a tiny "callus" or "pseudopore", a character which has been observed by us in some other collections of *Inocybe* taxa.

Inocybe brunneoatra (R.Heim) P.D.Orton
= *Inocybe fuscidula* Velen., s. Kuyp.
Material studied.- CADIZ: Crtra de Los Barrios a Facinas, 15-XI-1984, under *Quercus suber* in acid soil, GDAC 23653.
Previous records.- This material was previously recorded by Ortega & Esteve-Raventós (1989).

Inocybe calida Velen.
= *Inocybe brunneorufa* Stangl & Veselsky
Material studied.- HUELVA: Laguna del Sopetón (Doñana), 15-IV-1978, under *Halimium halimifolium* in grassy vegetation, Leg. F.D.Calonge, MA-FUNGI 325-2. Near the Palacio de Doñana, 23-II-1977, same habitat and legit, MA-FUNGI 326.
Comments.- The revision of MA-FUNGI 325 has shown that this collection contained two species, part of it identified by us as *I. calida*, and the rest belonging to *I. lacera*. Likewise, MA-FUNGI 326, which was identified as *I. asterospora* (Calonge & Telleria, 1980),

also belongs to Velenovsky's taxon. *I. calida* had not been recorded previously in the Iberian Peninsula.

Inocybe calospora Quél.
Previous records.- This species has been catalogued by Romero de la Osa (1991) from Huelva province under *Alnus glutinosa*, but without a collection number.

Inocybe cervicolor (Pers.) Quél.
= *Inocybe brunneovillosa* (Jungh.:Fr.) Dörfelt & Zschieschang, *s. auct.*, *non* Junghuhn (= *Inocybe bongardii* ?)
Material studied.- GRANADA: La Alfaguara, Casa forestal, 26-V-1979, under *Quercus ilex subsp. ballota* and *Pinus halepensis* in basic soil, GDAC 10559. Alhama de Granada, 14-XI-1979, under *Q. ilex subsp. ballota*, Leg. A.Ortega, GDAC 11343. HUELVA: Sierra de Aracena, 21-XI-1991, under *Q. suber* in acid soil, AH 14731. JAÉN: Sierra de Segura, crtra de Orcera a Siles, 29-X-1986, under *Q. ilex subsp. ballota* in basic soil, GDAC 27612. Sierra de Cazorla, Arroyo de la Teja, 31-X-1986, same habitat, GDAC 27611. Mata Bejid, 27-XI-1990, under *Q. ilex subsp. ballota* in basic soil, GDAC 36669. Pantano del Quiebrajano, 27-XI-1990, same habitat. GDAC 36670. MALAGA: Nava de San Luis, Serranía de Ronda, 12-XI-1986, under *Pinus nigra subsp. clusiana* in basic soil, GDAC 27613.
Previous records.- Anguita & al. (1992), Jiménez & al. (1991 and 1993) and Romero de la Osa (1991) have catalogued this species from Jaén and Huelva provinces respectively, but without any reference to a collection number or herbarium. Gómez-Fernández & al. (1993) have recently indicated its presence in the province of Córdoba, under pines and evergreen oaks. Apart from that, the collections GDAC 10559, GDAC 11343, GDAC 27611, GDAC 27612 and GDAC 27613 were previously recorded by Ortega & Esteve-Raventós (1989).
Comments.- We cannot accept *I. brunneovillosa* as the correct and prior name for *I. cervicolor*, as Dörfeldt & Zschieschang (1986) and Rauschert (1992) admit. Junghuhn's original diagnosis indicates: "... Odor saporque dulces", clearly in contradiction with the typical organoleptic character of *I. cervicolor*.

Inocybe cincinnata (Fr.) Quél.
= *Inocybe phaeocomis* (Pers.) Kuyp.
= *Inocybe cincinnatula* Kühner
Material studied.- CADIZ: Crtra de Los Barrios a Facinas (Parque Natural de los Alcornocales), 2-XII-1989, under *Quercus suber* in acid soil, GDAC 33970. GRANADA: La Alfaguara, casa forestal, 17-X-1977, under *Q. ilex subsp. ballota* in basic soil, GDAC 10560. Güejar Sierra, 1-XI-1989, under *Q. ilex subsp. ballota* in basic soil, GDAC 30390. La Alcaicería, 25-X-1990, under *Cistus laurifolius* in acid soil, GDAC 36697.
Previous records.- Malençon & Llimona (1980) registered the material GDAC 10560 without a collection number; this same material was re-studied and registered by us later as *I. phaeocomis* (Pers.) Kuyp. (Ortega & Esteve-Raventós, 1989).
Comments.- Differences between var. *cincinnata* and var. *major* are, in our opinion, of little consistency to maintain a varietal level and consider the latter a taxonomic form or variant.

Inocybe cookei Bres.
Material studied.- CADIZ: Sierra de la Luna, Algeciras, 17-XI-1987, under *Quercus suber* in acid soil, GDAC 30377. Crtra de Ubrique a Puerto de Galis (Parque Natural de los Alcornocales), 16-XI-1987, same habitat. GDAC 30383. We have also seen it very abundantly in Sierra de Aracena (Huelva) under *Q. suber*.

Inocybe corydalina Quél.
Material studied.- GRANADA: Alhama de Granada, 10-XII-1987, under *Quercus ilex subsp. ballota* in basic soil, GDAC 30379. HUELVA: proximidades de Alájar, 20-XI-1990, under *Q. suber* in acid soil, GDAC 36639.
Previous records.- Calonge & Tellería (1980) from Palacio de Doñana, Huelva, under *Quercus suber*, MA-FUNGI 187; the study of this collection has revealed that it belongs to *I. haemacta* (see there).

Inocybe dulcamara (A.& S.) Kumm.
Material studied.- GRANADA: Alfaguara, Casa forestal, 10-X-1976, under *Pinus halepensis* in basic soil, GDAC 9644. Fuente Agrilla, Sierra Nevada, 18-X-1977, under *Q. ilex subsp. ballota* and *Salix atrocinerea* in basic soil, GDAC 9646 and GDAC 9647. Río Bastidas (Parque Natural de la Sierra de Baza), 2-XI-1992, under *Populus* in basic soil, GDAC 36247. Parque Natural de la Sierra de Huétor, 10-XI-1991, under *Pinus pinaster* in basic soil, GDAC 36322. La Alcaicería, 25-X-1990, under *Cistus laurifolius* in acid soil, GDAC 36671. Güéjar Sierra, 29-X-1990, under *Quercus ilex subsp. ballota* in basic soil, GDAC 36691. JAÉN: Cortijo de las Acebeas, Sierra de Segura, 30-X-1986, under *Quercus ilex subsp. ballota, Pinus halepensis* and *Ilex aquifolium* in basic soil, GDAC 27615.
Previous records.- Malençon & Llimona (1980) cited it from Granada without a collection number, this material now belonging to GDAC 9646 and GDAC 9647. Anguita & al.(1992) and Jiménez & al.(1991 and 1993) have also catalogued this species from Jaén province, without a collection number. Lastly, Ortega & Esteve-Raventós (1989) previously recorded the collections GDAC 9644, GDAC 9646, GDAC 9647 and GDAC 27615, listed above.
Comments.- Curiously, the material studied only comes from the eastern part of Andalusia, but this well known taxon is probably widespread in all the region. All the collections enumerated above belong to several "variants" of var. *dulcamara*. We have only recognized *I. malençonii* Heim as a separate species, owing to the quite different quotient (Q=L/l or length/width ratio) of the spores, but we would not reject the possibility of considering a varietal treatment for this taxon in the "*dulcamara* complex".

Inocybe dulcamara var. **homomorpha** Kühner
Material studied.- GRANADA: La Alfaguara, XI-1976, under *Pinus pinaster* in basic soil, MA-FUNGI 4957.
Comments.- This material was registered as *Inocybe gymnocarpa* by Varo & al. (1976).

Inocybe flocculosa (Berk.) Sacc.
= *Inocybe gausapata* Kühner, s. Kuyp.
= *Inocybe subtigrina* Kühner
Material studied.- GRANADA: Casas de D. Diego (Parque Natural de la Sierra de Baza), 7-XI-1990, under *Populus* in basic soil, GDAC 36248. JAÉN: Arroyo de la Teja, Sierra de Cazorla, 31-X-1986, under *Quercus ilex subsp. ballota* and *Pinus halepensis* in basic soil, GDAC 27616. Casa forestal de las Acebeas, Sierra de Segura, 12-XI-1990, under *Pinus nigra subsp. clusiana* and *Ilex aquifolium* in basic soil, GDAC 36673.
Previous records.- Ortega & Esteve-Raventós (1989) already recorded the collection GDAC 27616. Without a collection number and description, Malençon & Llimona (1980) recorded *I. gausapata* Kühner from Sierra Nevada (Granada), under *Populus*. As neither material nor description are available, we consider this register as doubtful. Also, Jiménez & al. (1991) have catalogued this taxon from Jaén province, without a collection number.

Inocybe flocculosa forma **crocifolia** (Herink) Esteve-Rav. & Ortega, **stat. & comb. nov.** (Basionym: *Inocybe crocifolia* Herink, Cêská Mykol. 8:123, 1954)
Material studied.- CÓRDOBA: Españares, crtra de Cardeña a Villa del Río, 24-XI-1988, under *Cistus ladanifer* in acid soil, GDAC 33971. JAÉN: El Centenillo, 23-XI-1988, under *Cistus*

sp. in acid soil, GDAC 33972. Mata Bejid, 27-XI-1990, under *Quercus ilex subsp. ballota* in basic soil, GDAC 36674.

Comments.- It seems to be a very common taxon under *Cistus sps.*, showing a wide range of variability in some macroscopical characters, notably the color of the pileus and lamellae and overall size. In Andalusia, there seems to be much intergradation among populations and the yellow color of the lamellae can be variable, even in the same collection. This is why we do not consider this to be a good character, even at varietal level, and propose the new combination for those populations showing a pallid to strong yellowish tint in the lamellae and stipe. This variability was already pointed out by Alessio (1984b) before, when dealing with "the *I. lutescens* Velen. group".

Inocybe fraudans (Britz.) Sacc.
= *Inocybe pyriodora* (Pers.:Fr.) Kumm., *s. auct. pl.*
= *Inocybe incarnata* Bres.

Material studied.- CADIZ: Puerto de Galis (Parque Natural de los Alcornocales), 1-XII-1988, under *Quercus suber* in acid soil, GDAC 33973. GRANADA: Alhama de Granada, 28-XI-1979, under *Q. ilex subsp. ballota* in basic soil, GDAC 10571. Same locality and habitat, 23-X-1979, GDAC 10572. La Alcaicería, 25-X-1990, under *Q. ilex subsp. ballota* and *Cistus* in acid soil, GDAC 36677. JAÉN: Pantano de Quiebrajano, 27-XI-1990, under *Q. ilex subsp. ballota* in basic soil, GDAC 36675. Mata Bejid, 27-XI-1990, same habitat, GDAC 36676. MÁLAGA: Nava de San Luis, Serranía de Ronda, 12-XI-1986, under *Q. ilex subsp. ballota* in basic soil, GDAC 27617. Jimera de Líbar (Parque Natural de los Alcornocales), 13-XII-1990, same habitat, GDAC 37085.

Previous records.- Malençon & Llimona (1980) cited, without a collection number, *I. pyriodora* var. *incarnata* from El Molinillo, Granada, under *Quercus ilex subsp. ballota*. Ortega & Esteve-Raventós (1989) recorded previously the collections GDAC 10571, GDAC 10572 and GDAC 27617, listed above. On the other side, the same last authors described, based on one-single specimen, *I. fraudans* var. *capitatocystidiosa var. nov ad. int.*; in spite of the absence of a good macroscopic description based on fresh specimens, we considered this taxon close to *I. fraudans* then, owing to the papillate spores. However, we have got to the conclusion that this scanty material is probably contaxic with *I. griseolilacina*, either the capitate cystidia or the spores matching the microscopic features of this taxon, though the lilaceous tints were absent in the exsicatta (GDAC 27618). Lastly, *I. fraudans* has been catalogued from Jaén province by Jiménez & al. (1993) without a collection number.

Inocybe fuscomarginata Kühner

Material studied.- GRANADA: La Alfaguara, Casa forestal, 30-V-1979, under *Populus nigra* in basic soil, GDAC 9645.

Previous records.- This material was already published by Ortega & Esteve-Raventós (1989).

Inocybe geophylla (Fr.:Fr.) Kumm.

Material studied.- CADIZ: Crtra de Los Barrios a Alcalá de los Gazules, 12-XI-1992, under *Quercus suber* in acid soil, AH 15316-variant "*fulva*". GRANADA: Sierra de Cázulas-Prados del Pinar, 4-XI-1979, under *Quercus ilex subsp. ballota* in basic soil, GDAC 10556. Alhama de Granada, 29-XI-1979, under *Quercus ilex subsp. ballota* in basic soil, GDAC 11344. Llano de la Perdiz, 17-I-1984, under *Pinus pinaster* in basic soil, GDAC 16085. Narváez (Parque Natural de la Sierra de Baza), 6-XI-1990, under *Pinus halepensis* in basic soil, GDAC 36249. Barranco de San Sebastián (Parque Natural de la Sierra de Baza), 7-XI-1990, under *Pinus sylvestris* in basic soil, GDAC 36250. La Alfaguara (Parque Natural de la Sierra de Huétor), 15-XI-1990, under *Pinus pinaster* and *Quercus ilex subsp. ballota* in basic soil, GDAC 36323- variant "*fulva*". La Alcaicería, 5-XI-1990, under *Quercus ilex subsp. ballota* and *Cistus sp.* in acid soil. GDAC 36679. Same locality, date and habitat, GDAC 36681. JAÉN: Sierra de Segura, Cortijo de las Acebeas, 30-X-1986, under *Pinus nigra* in basic soil, GDAC 27620. Same locality, 12-XI-1990, under *Pinus nigra* and *Ilex aquifolium*, GDAC 36680. MALAGA: Nava de San Luis, Ronda, 26-XI-1986, under *Quercus ilex subsp. ballota* in basic soil, GDAC 16133. Same locality and habitat, 22-XI-1984, GDAC 23684.

Previous records.- Strangely, there were no records before Ortega & Esteve-Raventós' (1989) contribution, in which these authors cited the collections GDAC 10556, GDAC 11344, GDAC 16085, GDAC 16133, GDAC 23684 and GDAC 27620, listed above. More recently, Romero de la Osa (1990) and Jiménez & al. (1991 and 1993) have catalogued this taxon from Huelva and Jaén provinces respectively, but without any collection number.

Comments.- This is the most abundant *Inocybe* species in all Andalusia. Variants with a yellowish tint on the pileus have been commonly named *I. geophylla* var. *fulva* (Pat.) Sacc., but this epithet is, according to Kuyper (1986:226), referred to *I. obscurobadia*. Our collections AH 15316 and GDAC 36323 belong to this fulvous, argillaceous or yellowish variant, very well depicted in Alessio (1980:tab 28, figs 3,4).

Inocybe geophylla var. **lilacina** (Peck) Gillet

Material studied.- GRANADA: Llano de la Perdiz, 22-XI-1979, under *Quercus ilex subsp. ballota* and *Pinus pinaster* in basic soil, GDAC 10567. Sierra de Cázulas, urbanización Prados del Pinar, 16-XI-1979, under *Pinus pinaster* in basic soil, GDAC 10568. Narváez (Parque Natural de la Sierra de Baza), 6-XI-1990, under *Pinus halepensis* and *P. nigra* in basic soil, GDAC 36251.

Previous records.- Ortega & Esteve-Raventós (1989) recorded the collections GDAC 10567 and 10568; later, Anguita & al. (1992), Jiménez & al. (1993) and Romero de la Osa (1991) have catalogued this variety in Jaén and Huelva provinces.

Inocybe glabrodisca P.D.Orton

= *Inocybe oblectabilis fo. decemgibbosa* Kühner

Material studied.- CADIZ: Crtra de Los Barrios a Facinas, 10-XI-1989, under *Quercus suber* in acid soil, GDAC 31866.

Comments.- This species had not been previously recorded in the Iberian Peninsula. A microscopical examination permits a clear distinction from *I. oblectabilis*.

Inocybe godeyi Gillet

Material studied.- JAéN: Puente de la Sierra, 25-IV-1989, under *Populus nigra* in basic soil, GDAC 30376. Pantano de Quiebrajano, 2-XI-1990, under *Quercus ilex subsp. ballota* in basic soil, GDAC 36682. Locality unknown, 20-X-1990, same habitat, GDAC 36683.

Inocybe griseolilacina J.E. Lange

= *Inocybe personata* Kühner

= *Inocybe pusio fo. elegans* Reumaux

Material studied.- CADIZ: Crtra de Ubrique a Puerto de Galis (Parque Natural de los Alcornocales), 16-XI-1987, under *Quercus suber* in acid soil, GDAC 30396. Crtra de Los Barrios a Alcalá de los Gazules, 12-XI-1992, under *Quercus suber* in acid soil, AH 15318. Same locality and habitat, 13-XI-1992, AH 15324. JAéN: Pantano del Quiebrajano, 2-XI-1990, under *Q. ilex subsp. ballota* in basic soil, GDAC 36684. MALAGA: Venta Garvey, crtra de Málaga a Colmenar, 18-XI-1987, under *Quercus suber* in acid soil, GDAC 30389.

Comments.- The material GDAC 30389 could be identified as *I. personata*, but we consider this to be a variant of *I. griseolilacina*. The lilaceous-violaceous tints in this group of *Inocybe* seem to be of little taxonomic value at a(n) (infra-)specific level, owing to the great variability showed; however, microscopic characters are quite constant and offer a more reliable reference in the identification than the cromatic ones (cf. remarks of *I. fraudans* var. *capitatocystidiosa*). Nevertheless, the presence of these pigments has importance in a systematic arrangement (Section *Lilacineae* R.Heim).

Inocybe gymnocarpa Kühner
Comments.- This taxon was registered by Varo & al. (1976) from Granada without a collection number; fortunately, the material has been preserved in MA-FUNGI 4957 and, after our revision, it clearly belongs to *Inocybe dulcamara* var. *homomorpha* (see there).

Inocybe haemacta (Berk. & Cooke) Sacc.
Material studied.- HUELVA: Palacio de Doñana, 4-II-1978, under *Quercus suber* in acid soil, MA-FUNGI 187.
Comments.- This material was previously recorded as *I. corydalina* by Calonge & Tellería (1980). The reddening of the flesh and the typical lageniform cystidia seem delimitative, though a taxonomical re-arrangement of the "*I. corydalina* complex" seems necessary; about this point, we agree with the taxonomical point of view of Heim (1931), unless steady microscopical characters stablish the limits. We follow Kuyper (1986) for the time being.

Inocybe halophila R.Heim
Comments.- It was registered by Calonge & Tellería (1980) from Doñana (Huelva), but after the revision of this material (MA-FUNGI 331), it belongs to *Inocybe lacera* (Fr.:Fr.) Kummer.

Inocybe hirtella Bres.
Material studied.- GRANADA: Parque Natural de la Sierra de Huétor, 15-XI-1991, under *Pinus* and *Quercus ilex subsp. ballota* and *Pinus pinaster* in basic soil, GDAC 36686. JAÉN: Arroyo de la Teja (Sierra de Cazorla), 31-X-1986, under *Pinus halepensis* and *Quercus ilex subsp. ballota* in basic soil, GDAC 27621. Casa forestal de las Acebeas (Sierra de Segura), 12-XI-1990, under *Pinus nigra* and *Ilex aquifolium* in basic soil, GDAC 36685. Mata Bejid, 27-XI-1990, under *Quercus ilex subsp. ballota* in basic soil, GDAC 36687. Same locality and habitat, 22-X-1990, GDAC 36688.
Previous records.- Ortega & Esteve-Raventós (1989) recorded the collection GDAC 27621.

Inocybe inodora Velen.
= *Inocybe fulvida* Bres.
= *Inocybe albidodisca* Kühner
Material studied.- GRANADA: Cortijo Narváez (Parque Natural de la Sierra de Baza), 6-XI-1990, under *Pinus halepensis* in basic soil, GDAC 33974. Same locality and habitat, 7-XI-1990, GDAC 33975. Parque Natural de la Sierra de Huétor, 19-XI-1992, under *Cedrus sp.* in basic soil, GDAC 36326. MÁLAGA: Yunquera, 2-V-1985, under *Pinus nigra* in basic soil, GDAC 27622.
Previous records.- Ortega & Esteve-Raventós (1989) recorded the collection GDAC 27622.

Inocybe lacera (Fr.:Fr.) Kumm.
Material studied.- HUELVA: Laguna del Sopetón (Doñana), 15-IV-1978, in grassy areas with *Halimium halimifolium*, Leg. F.D.Calonge, MA-FUNGI 325-1. Same locality, date and habitat, MA-FUNGI 331, Leg. and Det. F.D.Calonge (as *Inocybe halophila* Heim).
Previous records.- Calonge & Tellería (1980) registered MA-FUNGI 325 and MA-FUNGI 331 as *I. lacera* (Fr.) Quélet *s.* Ricken and *I. halophila* Heim, respectively.
Comments.- The revision of MA-FUNGI 325 has revealed to contain two different species, one belonging to *I. lacera* -two fruitbodies-, whereas a third fruitbody belongs to *I. calida*.

Inocybe laeta Alessio
Comments.- This taxon has been catalogued by Jiménez & al. (1993) from Jaén province, without any collection number. Owing to the scarce data about this taxon, its extreme rarity and, above all, the lack of herbarium specimens from Jaén, this record is better considered as doubtful.

Inocybe leiocephala Stuntz
= *Inocybe subbrunnea* Kühner
Material studied.- CADIZ: Pinar de San Cristóbal (Sierra de Grazalema), 20-XI-1984, under *Abies pinsapo* in basic soil, GDAC 27636.
Previous records.- This same material was registered by Ortega & Esteve-Raventós (1989).
Comments.- After the attentive reading of the protologue by Stuntz in Smith & Stuntz (1950), and the study of the holotypus by Kuyper (1986), we agree with the latter in considering *I. subbrunnea* as synonymous.

Inocybe maculata Boud.
Material studied.- CADIZ: Sierra de la Luna (Parque Natural de los Alcornocales), 17-XI-1987, under *Quercus suber* in acid soil, GDAC 30384. Crtra de Puerto de Galis a Jimena de la Frontera (Parque Natural de los Alcornocales), 13-XI-1992, under *Quercus suber* and *Quercus canariensis* in acid soil, AH 15322. Same locality, date and habitat, AH 15323.

Inocybe malençoni R.Heim
Material studied.- GRANADA: La Alfaguara, Casa forestal, 30-X-1979, under *Pinus pinaster* in basic soil, GDAC 9643. JAÉN: Cortijos Nuevos (Sierra de Segura), 29-X-1986, under *Pinus halepensis* in basic soil, GDAC 27623. Pantano del Quiebrajano, 2-XI-1990, under *Quercus ilex subsp. ballota* in basic soil, GDAC 36690.
Previous records.- Ortega & Esteve-Raventós (1989) recorded the collections GDAC 9643 and GDAC 27623.

Inocybe margaritispora (Berk. ap. Cooke) Sacc.
Comments.- This taxon was catalogued by Romero de la Osa (1991) from Huelva province but neither a microscopical study nor a collection number is indicated; therefore, we consider this record as doubtful.

Inocybe muricellata Bres.
Material studied.- CADIZ: Pinar de San Cristóbal (Grazalema), 1-I-1985, under *Abies pinsapo* in basic soil, GDAC 27624. Same locality, date and habitat, GDAC 27625. GRANADA: Parque Natural de la Sierra de Huétor, 19-XI-1992, under *Cedrus* in basic soil, GDAC 36252. La Alcaicería, 5-XI-1990, under *Cistus sp.* in acid soil, GDAC 36694. JAÉN: Pantano del Quiebrajano, 2-XI-1990, under *Quercus ilex subsp. ballota* in basic soil, GDAC 36693. MÁLAGA: Venta de Garvey, crtra de Málaga a Colmenar, 3-XII-1988, under *Quercus suber* in acid soil, GDAC 33976.
Previous records.- Ortega & Esteve-Raventós (1989) registered the collections GDAC 27624 and 27625.
Comments.- We prefer, at the time being, to consider the synonymy with *I. scabelliformis* and *I. scabella s.* Kühner, because some embarrasing collections show intermediate characters which could be adscribed either to *I. muricellata*, to *I. scabella* or to *I. scabelliformis*. According to the original description of the last taxon (MALENÇON & BERTAULT, 1970), the cystidia wall can be more or less yellow in ammonia, and more or less variable in size. It could be possible that, following Kuyper (pers. comm.) at the present time, some taxa could be recognized in this complex but, according to our material, a clear separation at varietal or specific level cannot be proposed. The study of the type-specimens should be carried out before accepting independent taxa.

Inocybe napipes J.E. Lange
Comments.- It has been catalogued by Jiménez & al. (1993) from Jaén province. By virtue of the absence of any description and a collection number, we prefer to consider this record as doubtful.

Inocybe nitidiuscula (Britz.) Sacc.
= *Inocybe friesii* R.Heim
Material studied.- GRANADA: Llano de la Perdiz, 11-II-1979, under *Pinus halepensis* in basic soil, GDAC 10540. Parque Natural de la Sierra de Baza, 6-XI-1990, under *Pinus halepensis* in basic soil, GDAC 36253. Same locality and habitat, 7-XI-1990, GDAC 36254. Same locality and habitat, 22-X-1992, GDAC 36255. JAÉN: Cortijos Nuevos (Sierra de Segura), 29-X-1986, under *Quercus ilex subsp. ballota* and *Pinus halepensis* in basic soil, GDAC 27634.
Previous records.- Ortega & Esteve-Raventós (1989) recorded the collections GDAC 10540 and GDAC 27634.

Inocybe oblectabilis (Britz.) Sacc.
Material studied.- JAÉN: Arroyo de la Teja (Sierra de Cazorla), 31-X-1986, under *Quercus ilex subsp. ballota* and *Pinus halepensis* in basic soil, GDAC 27626.
Comments.- This material belongs to var. *oblectabilis*.

Inocybe obscurobadia (J.Favre) Grund & Stuntz
= *Inocybe tenuicystidiata* Horak & Stangl
= *Inocybe leptocystis* Atk., *s.* Kühner
Material studied.- HUELVA: Sierra de Navahermosa (Aracena), 20-XI-1991, under *Quercus suber* in acid soil, AH 14675.

Inocybe pelargonium Kühner
Material studied.- GRANADA: Alhama de Granada, 10-XII-1987, under *Quercus ilex subsp. ballota* in basic soil, GDAC 33983.

Inocybe phaeodisca Kühner
Comments.- It has been catalogued by Jiménez & al. (1991) from Jaén province without a collection number and, in our opinion, this record should be considered as doubtful.

Inocybe aff. phaeoleuca Kühner
Material studied.- CÓRDOBA: Españares, crtra de Cardeña a Villa del Rio, 24-XI-1988, under *Cistus ladanifer* in acid soil, GDAC 33982.
Comments.- The collection consists of only one specimen which shows many affinities with *I. phaeoleuca*, but with pleurocystidia quite long and narrow (60-85 x 12-16 µm, wall -2,5 µm), somewhat diverging from those in Kuyper (1986); on the other hand the rest of the macro- and microscopical characters fit well for this species. For the time being, we prefer to study more material to check this variability in cystidial characters.

Inocybe praetervisa Quél.
Material studied.- CÁDIZ: crtra de Ubrique a Puerto de Galis (Parque Natural de los Alcornocales), 15-XI-1987, under *Quercus suber* in acid soil, GDAC 30386.
Previous records.- Jiménez & al. (1991) have catalogued this species from Jaén without description and collection number; for the present time, we prefer to consider this register as doubtful.

Inocybe pseudodestricta Stangl & Veselsky
= *Inocybe destricta* (Fr.) Quél. *s.* Bres.
Material studied.- GRANADA: Cortijo Narváez (Parque Natural de la Sierra de Baza), 6-XI-1990, under *Pinus halepensis* in basic soil, GDAC 33974. MÁLAGA: Nava de San Luis (Ronda), 30-XI-1989, under *Quercus ilex subsp. ballota* in basic soil, GDAC 33981.
Comments.- Our material fits perfectly Alessio's (1980) concept of *I. destricta*, a species with distinctly rimose pileus, robust habit and more or less yellow cystidia-wall.

Kuyper (1986) indicates a colourless cystidia-wall, but he points out that the lamellae are yellowish in this taxon, very close in other respect to *I. fuscidula*. Anyhow, we think that a revision of the taxa belonging to the *I. fuscidula* and *I. nitidiuscula* complex remains necessary.

Inocybe pudica Kühner
= *Inocybe whitei* (B. & Br.) Sacc.,s. Kuyp.
Material studied.- GRANADA: Prados del Pinar (Sierra de Cázulas), 16-XI-1979, under *Quercus pyrenaica* in acid soil, GDAC 10569.
Previous records.- Ortega & Esteve-Raventós (1989) registered the collection cited above. Also, Jiménez & al. (1991) have catalogued this species from Jaén province, without a collection number.
Comments.- We prefer to accept Kühner's epithet, in spite of Kuyper's opinion; the protologue of *Agaricus whitei* does not indicate the typical character of this taxon.

Inocybe pusio P. Karst.
Material studied.- CADIZ: Crtra de Puerto de Galis a Jimena de la Frontera, 13-XI-1992, under *Quercus suber* in acid soil. GDAC 37094. MALAGA: Nava de San Luis (Ronda), 30-XI-1988, under *Quercus ilex subsp. ballota* in basic soil, GDAC 30388.
Previous records.- Catalogued by Jiménez & al. (1991) from Jaén province without any data and collection number.

Inocybe quietiodor M.Bon
= *Inocybe cookei* s. Kühner
Material studied.- CADIZ: crtra de Ubrique a Puerto de Galis (Parque Natural de los Alcornocales), 15-XI-1987, under *Quercus suber* in acid soil, GDAC 33980. Crtra de Alcalá de los Gazules a Puerto de Galis (Parque Natural de los Alcornocales), 14-XI-1992, under *Alnus glutinosa* in acid soil, AH 15598.

Inocybe rimosa (Bull.:Fr.) Kummer
= *Inocybe fastigiata* (Schaeff.) Quél. *s. auct. pl.*
Material studied.- CADIZ: crtra de Puerto de Galis a Jimena de la Frontera (Parque Natural de los Alcornocales). 13-XI-1992, under *Quercus suber* and *Q. canariensis* in acid soil, AH 15325. GRANADA: Alhama de Granada, 14-XI-1979, under *Pinus halepensis* and *Quercus ilex subsp. ballota* in basic soil, GDAC 10562. Pantano de Cubillas, 14-X-1979, under *Pinus halepensis*, GDAC 10563. JAEN: Pantano del Quiebrajano, 2-XI-1990, under *Quercus ilex subsp. ballota* in basic soil. GDAC 36701. MALAGA: Nava de San Luis (Ronda), 12-XI-1986, under *Abies pinsapo* in basic soil, GDAC 27628.
Previous records.- Ortega & Esteve-Raventós (1989) registered the collections GDAC 10562, GDAC 10563 and GDAC 27628. It has also been recorded from the provinces of Córdoba (Gómez-Fernández & al., 1993). Huelva (Romero de la Osa, 1990) and Jaén (Anguita & al., 1992; Jiménez & al., 1991 and 1993).
Comments.- All the material studied and enumerated above belongs to the type-variety, type-forma; based on our own criteria, we have considered to stablish a varietal-range for those collections with constant microscopic divergences, and a formal-range for those ecotypes or mere variants that can be recognized macroscopically. In the Mediterranean, those taxa described by Malençon & Bertault (1970) and Alessio (1980, 1983 and 1984) within the *Inocybe fastigiata* complex are commonly found. Those who prefer a systematic treatment at subspecific or varietal level may follow Dermek & Veselsky (1977), but we accept Kuyper's concept. Populations that can be distinguished clearly on account of their macroscopic characters are given a formal rank next.

Inocybe rimosa var. **flavella** (P.Karst.) Ortega & Esteve-Rav.
= *Inocybe xanthocephala* P.D.Orton , s. Kuyp.
Material studied.- CADIZ: crtra de Los Barrios a Facinas, 13-XI-1986, under *Quercus ilex subsp. ballota* in acid soil, GDAC 27627. GRANADA: Fuente Agrilla (Sierra Nevada), 29-X-1978, under *Quercus faginea* and *Q. pyrenaica* in acid soil, GDAC 10564. La Alcaicería, 25-XI-1990, under *Cistus sp.* in acid soil, GDAC 36672.
Previous records.- The collections GDAC 10564 and GDAC 27627 were already recorded by Ortega & Esteve-Raventós (1989).

Inocybe rimosa fo. **argentata** (Kühner) Courtecuisse
Material studied.- CADIZ: crtra de Los Barrios a Alcalá de los Gazules (Parque Natural de los Alcornocales), 12-XI-1992, under *Quercus suber* in acid soil, AH 15317. Same locality, date and habitat, AH 15321. JAÉN: Cortijos Nuevos (Sierra de Segura), 29-X-1986, under *Pinus halepensis* in basic soil, GDAC 27629. Cortijo de las Acebeas (Sierra de Segura), 30-X-1986, under *Pinus halepensis* and *P. nigra subsp. clusiana* in basic soil, GDAC 27630. Arroyo de la Teja (Sierra de Cazorla), 31-X-1986, under *Pinus halepensis* in basic soil, GDAC 27631.
Previous records.- The collections GDAC 27629, 27630 and 27631 were already registered by Ortega & Esteve-Raventós (1989).

Inocybe rimosa fo. **cerina** (Malenç.) Quadraccia
Material studied.- JAÉN: Los Villares, 1-XII-1989, under *Quercus ilex subsp. ballota* in basic soil, GDAC 31424.

Inocybe rufula Malenç. ex Alessio
= *Inocybe brunnea* Quél. *p.p.*
= *Inocybe tarda* Kühner *s. auct.*
= *Inocybe rufuloides* M.Bon ?
Material studied.- JAÉN: Cortijos Nuevos (Sierra de Segura), 29-X-1986, under *Pinus halepensis* in basic soil, GDAC 27633. GRANADA: Fuente de la Teja (La Alfaguara), 10-V-1978, under *Pinus halepensis* in basic soil, GDAC 10565. El Robledal (Alhama de Granada), 29-XI-1986, under *Pinus halepensis* in basic soil, GDAC 27614.
Previous records.- The collection GDAC 27633 was already registered by Ortega & Esteve-Raventós (1989). The same authors also cited the collections GDAC 10565 and GDAC 27614, as *Inocybe brunnea s. auct.*
Comments.- This complex is in need of a thorough research; the synonymy of *I. rufuloides* seems quite probable, having this taxon nomenclatural priority, but the study of many collections seems to be necessary before adopting such conclusion.

Inocybe sindonia (Fr.) P.Karst.
= *Inocybe kuehneri* Stangl & Veselsky
= *Inocybe lucifuga* fo. *gralla* Furrer-Ziogas
= *Inocybe eutheles* s. Kühner, *auct. pl.*
Material Studied.- CADIZ: crtra de Alcalá de los Gazules a Puerto de Galis (Parque Natural de los Alcornocales), 14-XI-1992, under *Alnus glutinosa* in acid soil, AH 15598. JAÉN: Cortijo de las Acebeas (Sierra de Segura), 30-X-1986, under *Quercus ilex subsp. ballota*, *Ilex aquifolium* and *Pinus halepensis* in basic soil, GDAC 27635.
Previous records.- GDAC 27635 was already registered by Ortega & Esteve-Raventós (1987).
Comments.- We have followed Kuyper's treatment for this taxon.

Inocybe splendens R.Heim
= *Inocybe terrifera* Kühner, s. Kuyp.
= *Inocybe alluvionis* Stangl & Veselsky

Material studied.- JAÉN: Proximidades de Jaén, 12-XI-1988, under *Quercus ilex subsp. ballota* in basic soil, GDAC 33978.

Inocybe cf. squamata J.E. Lange

Material studied.- GRANADA: La Alcaiceria, 25-X-1990, under *Cistus sp.* in acid soil, GDAC 36705.

Comments.- Though this material shows the typical scaly pileus, a moderately high percentage of the spores are not ovoid, showing shapes more likely to be abscribed to *I. rimosa*.

Inocybe striata Bres.

= *Inocybe acuta s. auct., non* Boud.

Material studied.- JAÉN: Cortijo de las Acebeas (Sierra de Segura), 24-V-1990, under *Pinus nigra subsp. clusiana* in basic soil, GDAC 36698.

Inocybe tenebrosa Quél.

= *Inocybe atripes* Atk.

Material studied.- CADIZ: crtra de Los Barrios a Alcalá de los Gazules (Parque Natural de los Alcornocales), 12-XI-1992, under *Quercus suber* in acid soil, AH 15599.

Inocybe terrigena (Fr.) Kuyp.

Previous records.- Jiménez & al. (1993) have catalogued this species from Jaén province without any description and collection number and, therefore, we consider this record as doubtful.

Inocybe sp.

Material studied.- JAÉN: El Centenillo, 26-XI-1987, under *Quercus ilex subsp. ballota* in basic soil, GDAC 33979.

Comments.- This material shows macroscopic characters of *I. albomarginata*, and spores of *I. amblyspora*. On the other hand, neither of both taxa show the characteristic cystidial shape of this collection. A re-evaluation of some characters in this complex of taxa, especially spore dimensions, size of the fruitbodies and presence/absence of a bulbous stipe, should be carried out. Our collection, which consists of five, well-preserved fruitbodies, shows typically lageniform pleuro- and cheilocystidia, with many long and flexuose necks, sometimes reminding those of *I. obscurobadia*, with walls up to 1.5 µm, hardly yellowish in NH_4OH (but caulocystidia covering all the stipe).

ACKNOWLEDGEMENTS

We wish to thank Dr. T.W. Kuyper for his revision and expert comments of some critical species. To Dr. F. Pando, Curator of the Real Jardin Botánico de Madrid, for handing us the collections of *Inocybe* from Andalusia kept at MA-FUNGI. F. Esteve-Raventós wishes to thank the DGICYT (Dirección General de Investigación Científica y Técnica) for granting the research project "Flora Micológica Ibérica II" PB92-0012, in which this work is included. Lastly, A. Ortega also thanks the DGICYT for granting the project PB90-0986 "Estudio de los hongos que fructifican en el Parque Natural de los Alcornocales (Andalucía, España)", to which some of the taxa listed above belong.

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Diabolidium, a new genus of rust fungi (Uredinales)*

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During a field stay in Venezuela a rust fungus was collected on leaves of a *Calliandra* sp. (Mimosaceae). The rust could not be assigned to any of the known genera and a new genus, *Diabolidium*, is proposed.

Diabolidium R. Berndt, gen. nov.

Spermogoniis, aeciis et urediis ignotis. Teliis subcuticularibus. Hymenio tecto peridio. Teliosporis 4-cellularibus, cellulis seriatis, constitutis rectangulariter. Pedicelo cum cellulis apicalibus.

Spermogonia, aecia and uredia unknown. Telia subcuticular, covered by a peridium. Teliospores four-celled, cells seriate and arranged rectangularly. Teliospore pedicel with apical cells.

Diabolidium calliandrae R. Berndt, sp. nov.

Teliis amphigenis, atro-brunneis, hemisphaerico-conicis, vix maculae in foliis efficentis. Hymenio diu tecto peridio. Peridium parietibus cellularum mortarum fungi nascendum, dehiscendum maturitate. Paraphysibus nullis. Teliosporis 4-cellularibus, plus minusve trapeziformibus, 38-42 μm latis x 28-31 μm altis. Membrana castaneo-brunnea, 1-1.5 μm crassa, sparse spinulosa, spinulis 3-4 (-5) μm longis, poris germinationis obscuris. Teliosporis pedicello hyalino cum duobus cellulis apicalibus sustentis. In foliis *Calliandrae* sp.

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* Part 98 of the series "Studies in Heterobasidiomycetes".

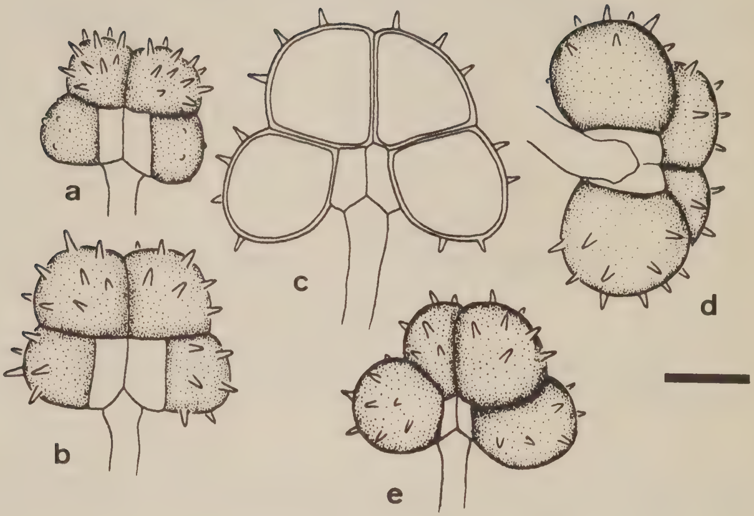


Fig. 1. Teliospores of *Diabolidium calliandrae*. (a) young developmental stage of teliospore; the spines of the lower teliospore cells are just developing. (b) young teliospore, (c) optical section through mature teliospore, (d) mature teliospore from below, (e) mature teliospore, lower cells shifted out of the trapezium plane. Scale bar 10 μm.

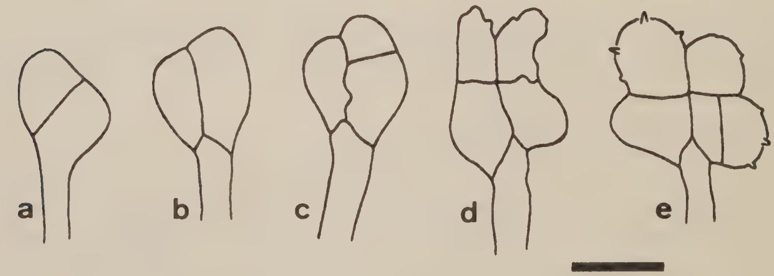


Fig. 2. Stages of teliospore development of *Diabolidium calliandrae*. Explanation in the text. Scale bar 10μm.

Telia amphigenous, blackish-brown, round, flat conical, producing little decoloration of the host. Telia non-paraphysate, for a long time covered by the cuticle and the fungal peridium. Peridium formed by gelatinized fungal cell walls. At maturity the telia open by a rupture of the cuticle and the peridium. Teliospores 4-celled, more or less trapezium-shaped, spores 38-42 x 28-31 μm, the wall 1-1.5 μm thick, sparsely spinulose, spines 3-4 (-5) μm long, germ pores not seen. Pedicel hyaline with two apical cells.

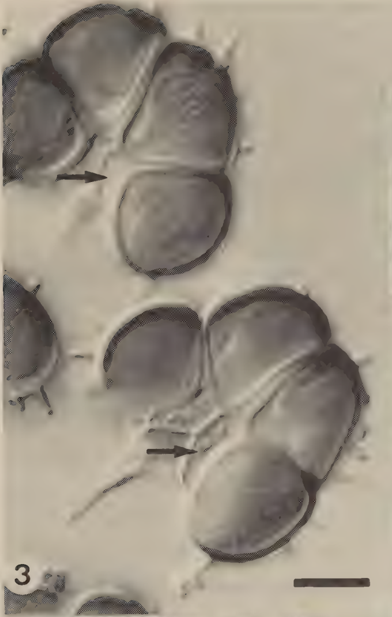
Holotype on leaflets of a *Calliandra* sp. Venezuela, state of Bolívar, Sta. Elena de Uairen. 4. I. 1994, R. Berndt & V. Faust-Berndt. Type in the author's herbarium HeRB A151; isotypes in VEN (Caracas) and VIA (Maracay).

RESULTS AND DISCUSSION

The four-celled more or less trapezium-shaped teliospores of *Diabolidium calliandrae* are very distinctive (Figs. 1, 3, 4). Most often the four cells are arranged in a plane (Figs. 1a-d), but in some spores the lower cells project, one back, one to the front, from the plane of the trapezium (Fig. 1e). Despite careful examination of the wall of the teliospores, germ pores could not be found. The ontogeny of the teliospores could be reconstructed from different ontogenetic stages of the spores (Figs. 2, 4). First two cells are cut off (Figs. 2a-b) from an elongated, slightly inflated terminal hymenial cell by two oblique septa. The originating spore initials divide to produce a four-celled stage (Figs. 2c-d). The upper cells differentiate further into teliospore cells; the lower cells divide again giving rise to the lower teliospores and the apical cells (Figs. 1a, 2e).

The telia of *D. calliandrae* are formed subcuticularly (Fig. 5). A distinctive feature of the species is the formation of a rigid peridium (Figs. 5, 6). The peridium derives from elongated cells which are formed early in the telial ontogeny. The outer periclinal walls of these cells are thick and gelatinized (Figs. 5, 6). During the development of the telia these cells die and almost vanish. Only the outer periclinal walls remain and form the rigid peridium. A somewhat similar kind of peridium formation has been illustrated by Cunningham (1889) for *Ravenelia sessilis* Berk., and could also be found in *R. pithecolobii* Arthur and *R. havanensis* Arthur (Berndt, unpublished). In these cases, however, the cuticle of the host just sloughed off together with remnants of hyphae of the subcuticular mycelium; a persisting peridium was not formed.

The pedicelate teliospores arise from a pseudo-parenchymatous hymenium of square, slightly thick-walled cells (Fig. 7). The walls of the epidermal cells of the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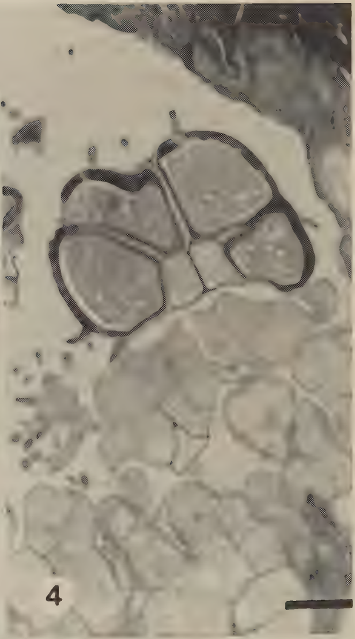
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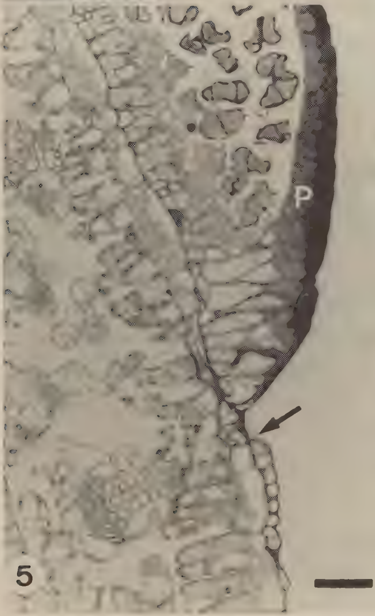
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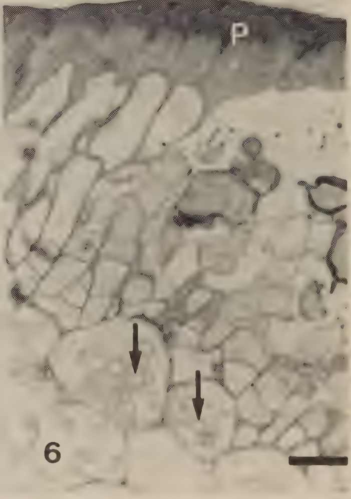
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host were penetrated by the parasite, and intracellular hyphae were formed within the epidermal cells. Intracellular hyphae could also be found in the mesophyll cells (Fig. 7).

Proximally the intracellular hyphae were septated and relatively broad. They became thinner apically and branched into extremely fine, coiled processes (Fig. 7). The parasitic interaction of the raveneliaceous rusts has not been studied in much detail. Rajendren (1972) and Tyagi & Prasad (1972) investigated several *Ravenelia* spp. Rajendren (1972) found that the parasitic mycelium of *Ravenelia sessilis* Berk. and *R. berkeley* Mundk. & Thirumal. was strictly intracellular and did not form haustoria. This type of interaction was also found in *D. calliandrae*. There is considerable diversity of the parasitic interaction, however, within the genus *Ravenelia*, and also species forming typical D-haustoria are known (Rajendren, 1972).

Systematic position of *Diabolidium calliandrae*. - *D. calliandrae* shares the presence of apical cells with only a few other genera of rust fungi: These are *Anthomyces*, *Apra*, *Diabole*, *Dicheirinia*, and *Diorchidiella*, all belonging to the Raveneliaceae (Cummins & Hiratsuka 1983, Hennen & Freire 1979). *Trachyspora*, also with an apical cell on the teliospore pedicel, does not belong in this family but to the Sphaerophragmiaceae (Cummins & Hiratsuka, 1983).

Judging from the teliospore characters and the subcuticular ontogeny of the telia, *Diabolidium* most probably belongs to the Raveneliaceae. As pycnidia have not yet been found, a more definite assignment is not possible.

Delimitation of the genus. - *Diabolidium calliandrae* can be distinguished easily from the monotypic genera *Diorchidiella* and *Apra* whose species have two-celled teliospores. The teliospore cells of *Apra bispora* are not laterally joined and have separate apical cells. The single species of the genus *Anthomyces*, *A. brasiliensis* Dietel, has smooth teliospores and is probably close to *Dicheirinia*.

Diabolidium appears to be related most closely to the genera *Diabole* and *Dicheirinia*, considering the overall similarity of their teliospores. There are, however, im-

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Fig. 3. Teliospores of *Diabolidium calliandrae*. Two apical cells are indicated by arrows. Scale bar 10 μm. **Fig. 4**. Semithin section through mature teliospore and various developmental stages of teliospores. Scale bar 10 μm. **Fig. 5**. Section through a mature telium. At the periphery of the telium the subcuticular origin (arrow) of the telium can be seen. The hymenium is covered by a peridium (P). Scale bar 30 μm. **Fig. 6**. Section through the rim of a telium. The peridium (P) is formed by thick, gelatinized walls (arrowheads) of dead fungal cells. The epidermal cells of the host are infested by intracellular hyphae (arrows). Scale bar 20 μm.

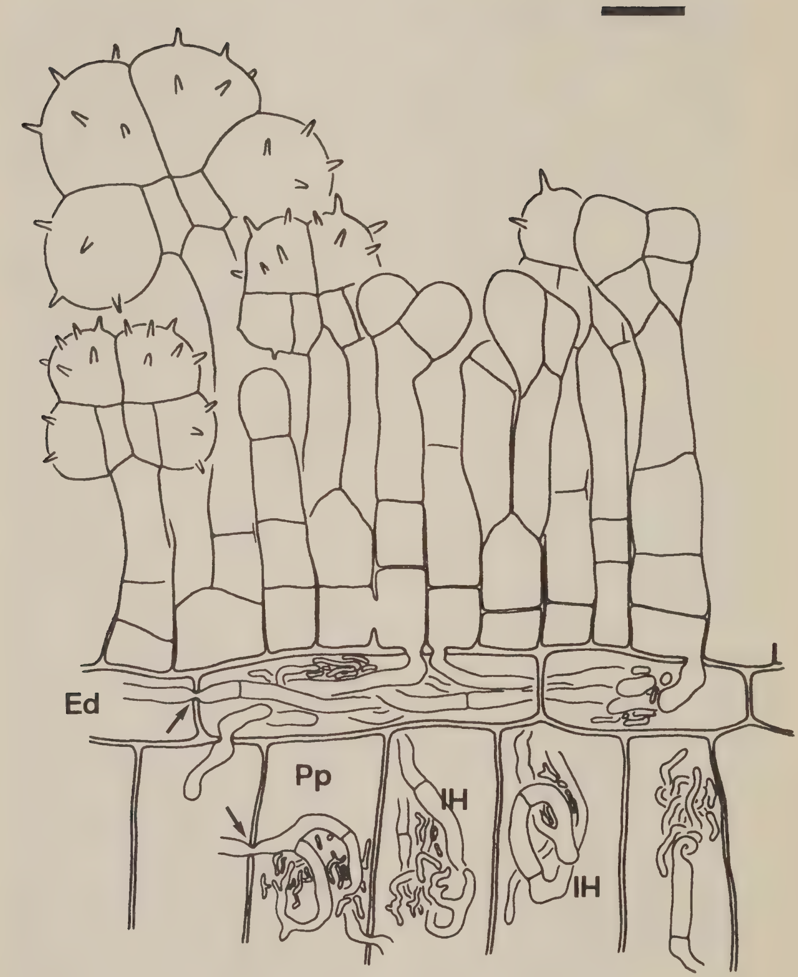

Fig. 7. Section through the telial hymenium of *Diabolidium calliandrae* and the host tissue . The drawing is presented upside-down for easier orientation. The pseudo-parenchyma of the basal hymenial layers is formed directly upon the epidermal cells (Ed) of the host. The walls of epidermal cells and cells of the palisade parenchyma (Pp) are penetrated by the parasite (arrows) and intracellular hyphae (IH) are formed. Scale bar 10 μm.

portant differences which make necessary generic delimitation of the new fungus (the main differences between *Diabolidium*, *Diabole* and *Dicheirinia* are summarized in Table 1).

Table 1. Differences between *Diabolidium*, *Diabole* and *Dicheirinia*

	Diabolidium (*D. calliandrae*)	***Diabole*** (*D. cubensis*)	***Dicheirinia***
Arrangement of teliospore cells	seriate	in pairs	groups of 2-4(8) spores, non-seriate
Telium	subcuticular	subcuticular	subepidermal
Teliospores	4-celled	often 2-celled, sometimes several pairs	2-4-celled, rarely more
Germ pores	not seen	obscure*	one, apical
Apical cells per teliospore cell	two, one per two teliospore cells	one per pair of teliospore cells	mostly one, but variable
Paraphyses (in telia)	lacking	lacking	present in most species
Peridium	present	lacking	lacking

*The observations concerning the pores are contradictory: Arthur (1922) described a single germ-pore "in upper part of cell". Cummins (1935) could not definitely establish the site of the pores but assumed two pores in a subequatorial position.

In *Diabole*, with the single species *D. cubensis* Arthur, the telia develop subcuticularly and are non-paraphysate as in *Diabolidium calliandrae*. The telia do not have a peridium, however, and soon become naked. In contrast to *Diabolidium*, the teliospores arise in pairs on a single apical cell. Usually only one pair is present, but up to four pairs have been observed (Arthur 1925).

Diabolidium calliandrae differs from *Dicheirinia* spp. by several characters: (1) Arrangement of teliospores. - *D. calliandrae* invariably has four-celled teliospores with seriate teliospore cells, i. e. they are arranged more or less in a row. In *Dicheirinia* spp. the teliospore heads are two-celled, three-celled or rarely four- to eight-celled (*D. spinulosa* (Baxter) Hennen & Cummins, comp. Hennen &

the species with more than two teliospores per head the spores are not seriate. (2) Number of apical cells. - In *Diabolidium calliandrae* there are always two teliospore cells per apical cell. In *Dicheirinia* the number of teliospore cells normally equals the number of apical cells. In *D. ormosiae* (Arthur) Cummins, however, the two-celled teliospores are borne on a single apical cell, and the three-celled teliospores of *D. guianensis* are sometimes borne on two apical cells (Cummins 1935). Because of this variability of the number of apical cells, the seriate arrangement of the teliospores in *Diabolidium calliandrae* appears to be the most important telial character for a separation of the genus. (3) Peridium formation. - The telial peridium of *D. calliandrae* may serve as a further important delimiting character, as formation of peridia has never been observed in *Dicheirinia*. (4) Position of the telia. - In contrast to the subepidermal telia of all known *Dicheirinia* spp., the telia of *Diabolidium calliandrae* are subcuticular in origin. Possibly, this is not an important character for generic delimitation, as also in the genus *Ravenelia* species with subcuticular or subepidermal telia/uredia are found.

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The author thanks Prof. Dr. Y. Ono for pre-submission review and many helpful suggestions on the paper. Discussion on the paper with Prof. Dr. F. Oberwinkler and Dr. K. Vánky is greatly appreciated. The field work in Venezuela was financed by a grant of the Deutsche Forschungsgemeinschaft.

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CANNABIS PATHOGENS XII: LUMPER'S ROW

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Abstract:

The following *Cannabis*-pathogenic fungi have been reduced to obligate or facultative taxonomic synonyms: *Macrosporium cannabinum, Stemphylium cannabinum, Thyrospora cannabis* (under *Stemphylium botryosum); Sclerotinia kaufmanniana, Peziza kaufmanniana* (under *Sclerotinia sclerotiorum); Pleosphaerulina cannabina* (under *Leptosphaerulina trifolii), Gibberella quinqueseptata* (under *Gibberella cyanogena), Heliocomina cannabis* (under *Pseudocercospora cannabina), Vermicularia dematium* f. *cannabis* (under *Colletotrichum dematium), Diaporthe tulasnei* f. *cannabis* (under *Diaporthe arctii), Cryptosphaeria acuta* (under *Leptosphaeria acuta).* A neotypification of *Leptosphaeria acuta* is proposed herein.

Introduction:

A review of the literature reveals over 400 fungal taxa associated with *Cannabis* substrate. Many names among the 400 taxa represent obligate or facultative taxonomic synonyms. For instance, the fungus causing gray mold appears in the *Cannabis* literature under seven different names: *Botryotinia fuckeliana, Sclerotinia fuckeliana, Botrytis cinerea, Botrytis infestana, Polyactis infestana, Botrytis felisiana,*and *Botrytis vulgaris.* Similarly, fungi causing foot rot, hemp canker, and charcol rot each appear under six names. There are many others. Of course, not *all* taxonomists agree with *all* these synonyms, but *most* agree with *most.*

In addition to these previously recognized synonyms, twelve additional names are are reduced to synonyms of older taxa.

Materials and Methods:

Taxonomic literature was reviewed and voucher specimens located by methods described previously (McPartland, 1994). Common names of diseases follow those adopted by the American Phytopathological Society (McPartland 1991). Herbarium acronyms conform to Index Herbariorum (Holmgren *et al.*, 1990).

Fruiting bodies in voucher specimens were dislodged from host tissue with dissecting needles and rehydrated in 3% KOH, then measured at their widest part. They were either hand-sectioned with a razor blade or teased apart with needles under a 4x objective. Material was stained with either cotton blue in lactic acid or 1% phloxine in water (phloxine subsequently replaced with water by capillary action under cover slips). Curved spores were measured along their circumference, widths measured at their widest part, and means determined from 25 to 50 measurements. Materials were prepared for scanning electron microscopy as previously described (McPartland, 1984). One microscope slide of each taxon, with representative sections, was removed from the taxon's type and deposited at BPI.

Results and Discussion:

The following twelve taxa printed in bold type are placed in synonymy, described, and discussed:

Pseudocercospora cannabina (Wakefield) Deighton, 1976.
= ***Helicomina cannabis*** Ponnappa, 1977. Figs. 1-2

Conidiophores simple or occasionally branched, straight, septate, olivaceus brown, narrowing to a slender apex, up to 150 x 3.5-4.5 µm. Conidia with unthickened basal scars, cylindrical, straight to strongly curved, dilutely olivaceus, usually 5-7 septate, 30-90 x 3.5-5.5 µm.

Ponnappa's (1977) description of *H. cannabis* suggests a *Pseudocercospora* species. His type at the Commonwealth Mycological Institute (IMI #181336), proved to be indistinguishable from *P. cannabina*. Consequently, it belongs with *P. cannabina.*

Leptosphaerulina trifolii (Rostrup) Petrak, 1959.
= ***Pleosphaerulina cannabina*** Gutner, 1933. Fig. 3

Pseudothecia globose, brown, erumpent at maturity, ostiolate, nonparaphysate, thin walled, 120-250 µm diameter. Asci bitunicate, ovate, 8-spored, 50-90 x 40-60 µm. Ascospores hyaline (becoming light brown at maturity), oval to ellipsoid, smooth, with 3-4 transverse septa and 0-2 longitudinal septa, 25-50 x 10-20 µm.

L. trifolii displays a wide variation in ascospore and pseudothecium sizes, resulting in a large synonymy. To that synonymy I add *Pl. cannabina.* Gutner's description resembles that of *L. trifolii.* Inspection of Gutner's type specimen (deposited at LE) confirmed this conclusion.

Stemphylium botryosum Wallroth, 1833.
=***Stemphylium cannabinum*** (Bak. & Gut.) Dobrozrakova *et al.*, 1956.
≡***Macrosporium cannabinum*** Bakhtin & Gutner, 1933. Figs. 4-5
=***Thyrospora cannabis*** Ishiyama, 1936 [as *Tyrospora cannabis*].

Conidiophores arise in clumps (often 10-15), straight or flexous, simple or occasionally branched at their base, 1-7 septate, cylindrical except for swelling at site of spore formation, dilute olive brown except darkening at swollen apex, smooth except echinulate at swollen apex, 4-6 µm wide swelling to 7-10 µm at apex, usually 25 to 85 µm long, but continued proliferation through 1-5 previously-formed apices may extend conidiophore length to 120 µm (Fig. 5). Conidia initially oblong to subspherical, hyaline and verruculose; at maturity oblong to subdoliiform, densely echinulate, with 3 (sometimes 4) transverse septa and 2-3 (sometimes 4) complete or nearly complete longitudinal septa, with a single conspicuous constriction at the median transverse septum, dilute to deep olive brown, 30-35 x 20-25 µm.

Bakhtin & Gutner originally described *M. cannabinum* from hemp growing near Leningrad (St. Petersburg) in 1933. Dobrozrakova *et al.* (1956) transferred the species to *Stemphylium.* But their recombination lacks a full reference to the basionym, making it invalid by Article 33.2 of the ICBN (Greuter *et al.*, 1988). Also note Serzane (1962) and C.M.I. Index of Fungi [3(17):496] single out Khokhryakov as single author *in* Dobrozrakova *et al.* Inspection of the original article refutes this.

Curator C. Mel'vik graciously supplied Bakhtin & Gutner's type specimen from LE. The type contains conidia and conidiophores of *S. botryosum.* I sent a slide to E. G. Simmons, who concured with this identification.

Thyrospora cannabis was originally described in Japan as "*Macrosporium* sp." by Ishiyama (1936). He subsequently transferred the fungus to *Thyrospora,* a genus now synonymous with *Stemphylium.* Curators at TI, TNS and KYO would not respond to requests for Ishiyama's type specimen. Ishiyama's description of leaf symptoms and the fungus itself are identical to *S. botryosum;* consequently it is reduced to synonymy herein.

Traditionally, the teleomorph of *S. botryosum* has been misinterpreted as *Pleospora herbarum* (Pers.:Fr.) Rabenhorst ex Ces. & deNot. 1863. Careful research suggests they are different species (Simmons, 1985). The ascogenous state of *S. botryosum* is *Pleospora tarda* Simmons, 1985.

Gibberella cyanogena (Desmazières) Saccardo, 1883.

=***Gibberella quinqueseptata*** Sherbakoff, 1928.

Perithecia superficial, scattered, blue-black, globose, peridium textura angularis-globulosa, with a distinct ostiole, 150-300 µm in diameter. Asci clavate, 8-spored, 65-90 x 12-20 µm. Pseudoparaphyses present but evanescent. Ascospores ellipsoid, hyaline, straight, slightly constricted at 2-(3)-5 septa, 20-25 x 5-7 µm. Macroconidiophores hyaline, cylindrical, becoming subulate with age, forming palmately from metulae, phialidic, 12-20 x 3-5 µm. Macroconidia fusiform, hyaline, with a curved, pointed apical cell and a marked foot cell, usually 3-4 septate (range 0-6), 30-50 x 3.5-5.0 µm. Microconidia absent. Chlamydospores rare, single or short chains within hyphae or macroconidia, smooth-walled, 8-10 µm in diameter.

G. cyanogena is the most common cause of *Cannabis* stem canker. *G. quinqueseptata* belongs in the long list of *G. cyanogena* synonyms. Sherbakoff (1928) collected the fungus once, from hemp in Pierceton, Indiana. Mr. Sherbakoff described *G. quinqueseptata* briefly, "Differing from *G. saubinetti* [another synonym of *G. cyanogena.*] mainly by 5(3)-septate ascospores." Mature *G. cyanogena* ascospores often develop extra septa before germination. Sherbakoff's fungus never reappeared, and no records of a type (nor a specimen) exist at the National Fungus Collections (BPI).

Diaporthe arctii (Lasch) Nitschke, 1867.

=***Diaporthe tulasnei* f. *cannabis* Saccardo,** 1897. Fig. 6-7

Perithecial pseudostroma widely effuse over stem surface, appearing blackened, carbonaceous, interrupted by papillate ostioles erupting from its surface; ventral margin of pseudostroma delimited by a narrow dark-celled prosenchymatous "zone line." Perithecia immersed in stroma, globose to slightly flattened, solitary or gregarious, 160-320 µm in diameter with a conical ostiolated beak 280-480 µm tall. Asci unitunicate, clavate, with a apical refractive ring, 8-spored, 40-60 x 6-10 µm. Paraphyses elongate, multiseptate, branching at base, deliquescing at maturity. Ascospores hyaline, biseriate, guttulate, 1-septate when mature, slightly constricted at the septum, fusoid-ellipsoidal, straight or slightly curved, 10-15 x 2.5-4.0 µm. Pycnidia subglobose to lens-shaped (long axis parallel with the stem), immersed then erumpent, ostiolated (20 µm diameter), upper peridium black and stromatic, lower peridium parenchymous and pale sooty-brown, 200-450 x 100-190 µm. Conidiophores conical to cylindrical, less than 10 µm in length. Conidiogenous cells enteroblastic, phialidic, cylindrical to obclavate. A-conidia fusiform, attenuated ends, straight or slightly curved, hyaline, usually 1-septate and biguttulate, 7-10 x 2-3 µm. ß-conidia unicellular, filiform-hamate, 18-25 x 1 µm.

Wehmeyer (1933) describes *D. arctii* occuring on stems of many herbaceous hosts. *D. arctii* represents an aggregate species, to which belongs *D. tulasnei* f. *cannabis.*

Saccardo found *D. tulasnei* f. *cannabis* near Padova, Italy in November 1897. I examined an isotype at BPI (Saccardo exsiccatus, Mycotheca italica no. 91). Morphological characteristics of the teleomorph and anamorph correspond to *D. arctii.* (*D. tulasnei* Nitschke 1867 is probably a synonym of *D. arctii,* but I haven't inspected Nitschke's type.) Another cause of Phomopsis stem canker appears in the literature: *P. cannabina* Curzi 1927. But Curzi's descriptions of pycnidia, A-conidia and ß-conidia seem distinct from the anamorph of *D. arctii.* His type specimen is missing from the Pavia herbarium (Dr.ssa V. Terzo, Curator, personal communication). No specimens exist at any other major Italian herbaria, including MIPV, PAD, POR, SIENA, TO (McPartland, 1983). A lectotype or neotype must be located.

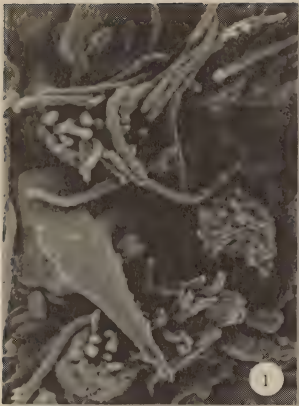
Colletotrichum dematium (Persoon) Grove, 1918.
=***Vermicularia dematium* f. *cannabis* Saccardo, 1880.** Fig. 8

Acervuli round to elongated in outline, up to 400 µm diameter, strongly erumpent through epidermis and exuding smokey gray conidial masses with divergent setae. Setae smooth, stiff, rarely curved, usually 3-4 septate, 4-7.5 µm wide at the base tapering to sharpened apices, 60-200 µm long. Conidiophores hyaline. Conidia hyaline, aseptate (becoming 2-celled during germination), smooth, thin walled, guttulate, falcate and curved, 18-26 µm long and 3-3.5 µm wide in the middle and tapering to pointed apices. Appressoria club-shaped to circular, medium brown, edge usually entire, 8-11.5 x 6.5-8 µm, often becoming complex.

C. dematium reportedly causes *Cannabis* anthracnose in Italy, on stems (Cavara,1889). Saccardo collected anthracnose specimens near Padova, from which he named a new subspecies, *V. dematium* f. *cannabis.* A Saccardo exsiccatus deposited at BPI (*Mycotheca Veneta* no. 1558) is morphologically indistinguishable from *C. dematium.*

Leptosphaeria acuta (Hoffman:Fries) P. Karsten, 1873.
=***Cryptosphaeria acuta*** (Hoffman:Fries) Greville, 1824.
?=***Leptosphaeria acuta* f. *cannabis*** Roumeguere, 1887.

Plate, facing page – photomicrographs of *Cannabis* pathogens: (1) Conidia and conidiophores of *Heliocomina cannabis* (=*Pseudocercospora cannabina*), SEM, x488; (2) Conidum of *H. cannabis,* LM, x939; (3) Asci and ascospores of *Pleosphaerulina cannabina* (=*Leptosphaerulina trifolii*), LM, x1012; (4) Conidia and conidiophores of *Stemphylium cannabinum* (=*Stemphylium botryosum*) SEM, x418; (5) Proliferating apices of *S. cannabinum,* SEM, x1613; (6) Sectioned perithecium of *Diaporthe tulasnei* f. *cannabis* (=*Diaporthe arctii*), LM, x117; (7) Ascospores of *Diaporthe tulasnei* f. *cannabis,* LM, x917; (8) Conidia and conidiophores of *Vermicularia dematium* f. *cannabis* (=*Colletotrichum dematium*), LM, x714.



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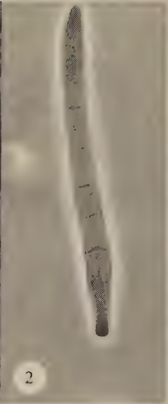

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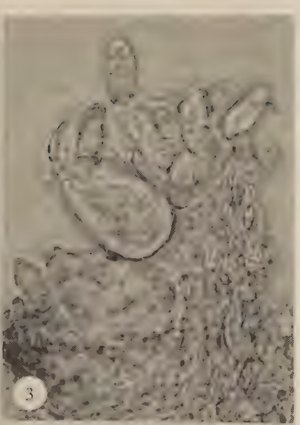

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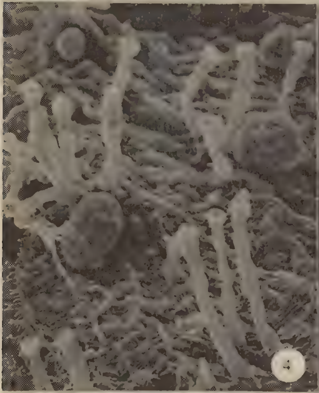

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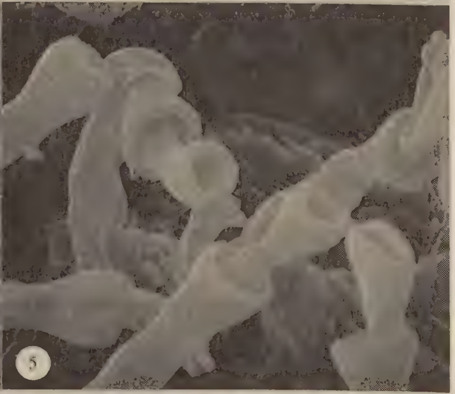

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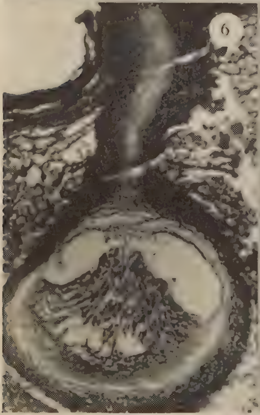

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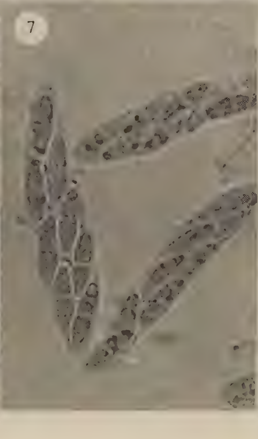

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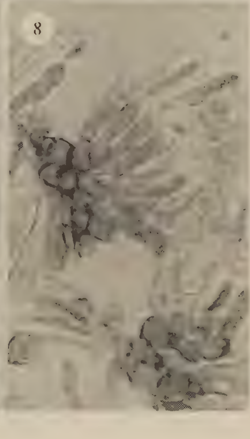

8

Many researchers cite the erroneous recombination *L. acuta* (Fuckel) P. Karsten. It appears Holm (1957) first employed Fuckel's name in this nomenclature, when he misinterpreted Höhnel (1915). Older literature cites the taxon *L. acuta* (M. & N.) Karsten, based on Mougeot & Nestler's exsiccatus (*Stirpes cryptogamae vogeso-rhenanae* no. 181, 1811). But Mougeot & Nestler term their exsiccatus *Sphaeria acuta* Persoon. Persoon, in turn, bases his taxon on Hoffman. Hoffman was a German contemporary of Persoon's, he introduced Goethe to cryptogamic botany.

Crane & Shearer (1991) reinstate Hoffman as basionym author. But they do not designate a type. Hoffman's specimen no longer exists. Hoffman's illustrations are poor, and cannot serve as a lectotype. Fries sanctioned *Sphaeria acuta,* so a lectotype should be selected from his protologue. This includes two exsiccati: Fries's *Scleromyceti Sueciae* (Fasc. 4) no. 118, and Mougeot & Nestler's aforementioned no. 181. After inspecting both exsiccati (at herb. BPI), the Mougeot & Nestler exsiccatus is judged a better neotype.

I include a *L. acuta* synonym omitted by Crane & Shearer (1991), *Cryptosphaeria acuta* Greville. Greville (1826) cites Hoffman in his synonymy.

Saccardo & Roumeguere (1883) describe *L. acuta* on hemp stems. Shoemaker (1984), Crane & Shearer (1991) and other authorities cite *L. acuta* as a specialized pathogen of *Urtica* species. Saccardo & Roumeguere reference an exsiccatus, *Reliquiae Libertianae* no. 191.

Roumeguere subsequently erected a new subspecies, *Leptosphaeria acuta* f. *cannabis,* distributed in *Fungi selecti exsiccati* (no. 4172, 1887). On the exsiccatus label, he designated Leige, Belgium as the type locality.

Exsiccatus no. 4172, at BPI, was nearly effete, containing only one juvenile fruiting body: psuedothecium conical, smooth, glistening black, peridium a thick-walled *textura globulosa* near ostiole, thereafter a radiating *textura prismatica,* 300 µm wide. Asci cylindrical, 8-spored, base constricted to a short pedicle, 60-70 x 7-9 µm. Paraphyses filiform, hyaline, septate. Ascospores pale yellow to golden brown, smooth, guttulate, fusiform, usually 3-septate and constricted at central septum, 33-40 x 2-3 µm.

The BPI specimen of *L. acuta* f. *cannabis* has smaller asci and ascospores than Shoemaker (1984) describes for *L. acuta.* But it is immature. The fungus's asci and ascospores seems too large to be accommodated in *L. doliolum* (Pers.:Fr.) Cesati & DeNotaris.

L. doliolum, like *L. acuta,* has a radiating *textura prismatica;* it attacks *Urtica* and many other hosts (Shoemaker, 1984; Crane & Shearer, 1991). Other *Leptosphaeria* species attacking Cannabaceae include *L. dumetorum* G. Niessl v. Mayendorf (on *Humulus lupulus* L.), *L. cannabina* Ferraris & Massa, and *L. woroninii* Docea & Negru (on *Cannabis sativa* L.).

Syntypes of *L. acuta* f. *cannabis* were not available at IMI, NYS, nor BR. BR, however, did forward three specimens labeled *L. acuta,* from *Reliquiae Libertianae* no.191. These specimens only contained an anamorph, a scleroplectenchymatous *Jahniella*-like species. Other exsiccati need to be inspected.

Sclerotinia sclerotiorum (Libert) deBary 1884.
=***Sclerotinia kauffmanniana*** (Tichomirow) Saccardo, 1889.
≡***Peziza kauffmanniana*** Tichomirow, 1868. Fig. 9

Sclerotia hard, yellow becoming black, smooth, oblong, 5-12 x 3-5 mm. Apothecia germinate from sclerotia on a brown cylindrical stalk up to 25 mm long, topped with a yellow-brown cup, concave, 2-8 mm wide. Asci cylindrical, 8-spored, bluing with melzer's reagent, 110-135 x 6-10 µm. Parapheses filiform, hyaline. Ascospores aseptate, elliptical, hyaline, usually biguttalate, 9-13 x 4-6 µm.

Tichomirow (1868) describes *P. kauffmanniana* causing hemp canker disease near Smolensk, USSR. He describes his fungus with slightly longer asci (150 x 8-10 µm) and wider ascospores (10 x 6.0-6.5 µm) than those of *S. sclerotiorum.*

Kohn (1979) could not locate Tichomirow's type specimen. My queries at MW and herb. LE were equally unsuccessful. In the case of missing specimens, the original author's illustrations can serve as a lectotype (ICBN, Art. 9.3, Greuter *et al.*, 1988). Tichomirow's illustrations (Fig. 9) appear to be identical with *S. sclerotiorum.*

No anamorph associates with *S. sclerotiorum.* Ferraris (1915) erroneously cites *Botrytis vulgaris* as the conidial stage of *S. sclerotiorum.* His mistake may stem from Kirchner's (1906) earlier error of calling *S. fuckeliana* the hemp canker organism.

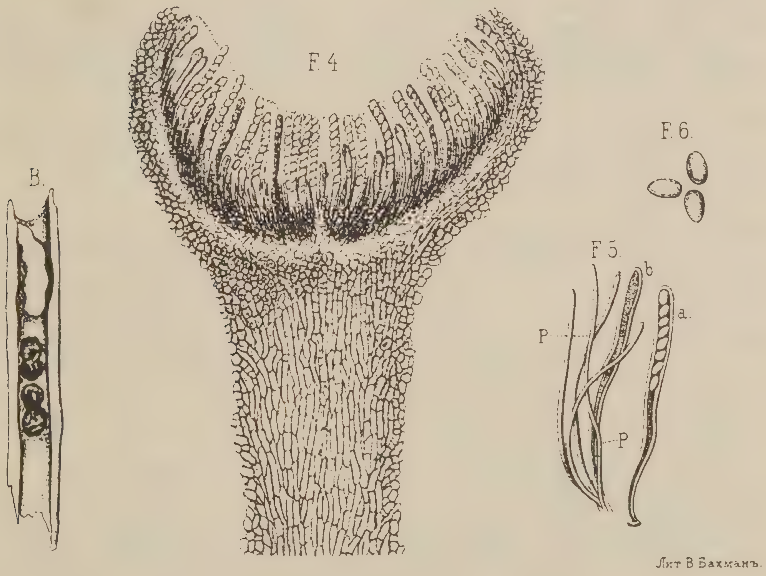

Fig 9: Photocopy reproduction, in part, of Tichomiroff's illustration, *Peziza Kauffmanniana,* from Bullétin Société Imperiale des Naturalistes de Moscou 41(2):Table 4 (1868).

Summary:

"Lumping" of synonymous taxa, plus the elimination of obligate saprophytes and misidentifications (McPartland, 1994a) distils the list of fungal species acting as *Cannabis* pathogens to approximately 88 (McPartland, 1991).

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MYCOTAXON

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STUDIES ON KERATINOPHILIC FUNGI. VI.
A NEW *ARTHROPSIS* (FUNGI IMPERFECTI) FROM MARINE SEDIMENTS

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SUMMARY

Arthropsis hispanica sp. nov. is described and illustrated. The fungus is characterized by having scarsely pigmented, relatively fast-growing colonies and hyaline to subhyaline arthroconidia very variable in size. A key to species of ***Arthropsis*** is given.

RESUMEN

En el presente trabajo se describe e ilustra ***Arthropsis hispanica*** sp. nov. Se caracteriza por presentar colonias escasamente pigmentadas, de crecimiento relativamente rápido, y por tener artroconidios de hialinos a subhialinos, tamaño muy variable. Se incluye una clave para la identificación de las especies de ***Arthropsis***.

In our studies on keratinophilic fungi inhabiting bottom sediments (river and marine water) from Spain, an interesting species of ***Arthropsis*** Sigler, Dunn & J.W. Carmich. (1982) has been recovered. The main characters do not agree with those of previously described species. It is described below as new.

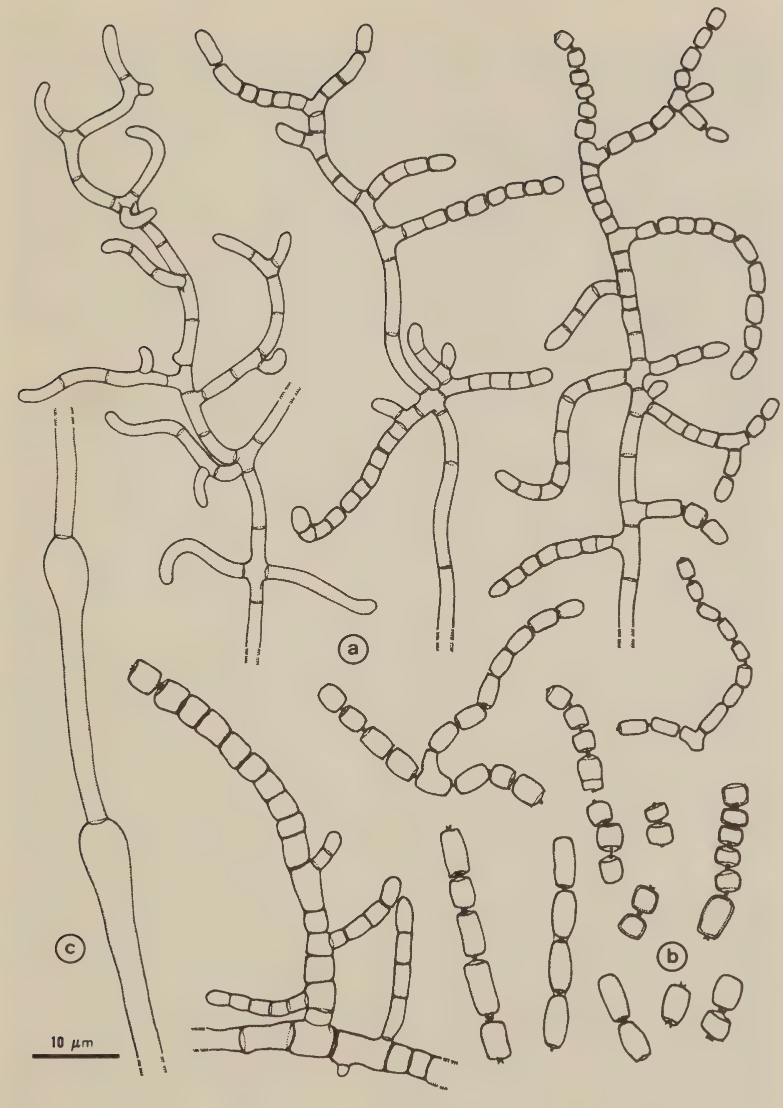
Arthropsis hispanica Gené, Ulfig & Guarro **sp. nov.** (Fig. 1, 2)
Etym.: referring to the country where the species was found.

Coloniae in agaro PYE ad 25° C moderata celeritate effusae, elevatae, quasi hemisphaericae, primum albae et floccosae, deinde luteolae, convolutae, purverulentae vel granulosae in centro, floccosae et zonatae in margine; margo definitus, regularis, fimbriatus; reversum incolorum. Hyphae vegetativae hyalinae, septatae, tenuitunicatae, laeviae, 1.5-4(5) µm latae. Hyphae claviformes praesentes. Conidiophora indifferentiata. Hyphae fertiles principales cristatae; hyphae principales rectae vel flexuosae, ramosae, 2-4 µm crassae, cum ramis lateralibus frequenter recurvis, perangustis, 1.5-3 µm crassis, basipetaliter divisis usque ad conidia enteroarthrica formanda, connexa per conjunctiones axiformes angustas (0.2-0.8 µm diam.). Arthroconidia hyalina vel subhyalina, tenui vel crassitunicata, laevia, cylindrica, cuboidea vel doliiforma, aliquando irregularia, frequenter latiora quam longiora, (1.5)2-7(10) x (1.9)2.5-3(4) µm, usualiter truncata utrimque, nonnumquam vestigia parietis exterioris post liberationem ferentia. Chlamydosporae absentes. Species moderate keratinolytica. Resistens 0.2 % cicloheximidae. Status sexualis ignotus.

Holotypus: IMI 353699, *ex sedimentis marinis, Hispania*. **Isotypus:** FMR 4058, CBS 351.92.

Colonies on PYE at 25° C growing moderately fast, with a mean daily spread of 2.3-2.7 mm, raised up to almost hemispherical, at first white and floccose, becoming yellowish-white, convoluted, powdery to granulose, with white mycelial tufts at the centre and concentric, floccose zonations at the periphery; margin defined, ± regular, fimbriate; reverse colourless, with some radial cracks at the periphery. Vegetative hyphae hyaline, septate, smooth- and thin-walled, variable in width, 1.5-4(5) µm. Racquet hyphae present. Conidiophores undifferentiated. Conidiogenous hyphae mainly in tufts; main hyphae straight to flexuose, 2-4 µm wide, lateral branches arising at right angles, often recurved, 1.5-3 µm wide, septating basipetally to form enteroarthric conidia, which are joined by distinct, narrow connectives (0.2-0.8 µm diam.). Arthroconidia hyaline to subhyaline, straight or curved, smooth- and thin-walled, cylindrical, cubic, barrel- or occasionally irregular-shaped, often broader than long, (1.5)2-7(10) x (1.9)2.5-3(4) µm, usually truncate at both ends, and occasionally showing remnants of outer wall at liberation. Chlamydospores absent. Teleomorph not observed.

Fig. 1. ***Arthropsis hispanica***, IMI 353699. a. Young and mature fertile hyphae; b. Arthroconidia; c. Racquet hyphae.


a
b
c
10 μm

Colonies on OMA with a mean daily spread of 1.8-2.5 mm, flat, white to yellowish-white, granulose, tufty; margin ill-defined, ± regular, fimbriate; reverse colourless.

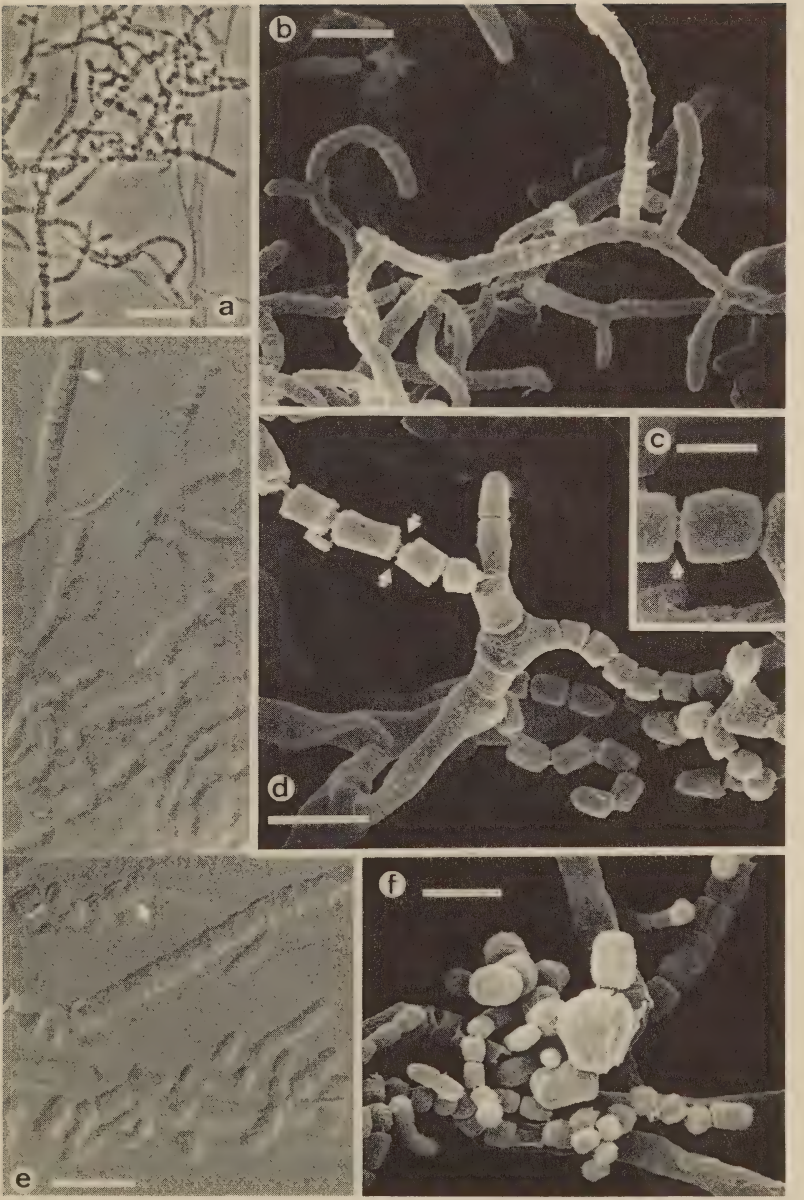
Colonies on PDA, Sabouraud and YpSs agar are very similar to those on the above media.

Restricted growth at 37°C. Resistant to 0.2% cycloheximide. Slightly keratinolytic.

Material examined: IMI 353699 (=FMR 4058, CBS 351.92), sediments, Empuriabrava Beach, Girona, 16 Sep. 1991; IMI 353700 (=FMR 4059, CBS 352.92), sediments, Estartit Beach, Girona, 17 Sep. 1991.

According to the original generic descriptions, ***Arthropsis*** (Sigler *et al.*, 1982) differs from ***Arthrographis*** Cochet ex Sigler & J.W. Carmich. (1976) in being dematiaceous and having undifferentiated conidiophores with distinct connectives between arthroconidia. Within the former, however, some heterogeneity has been observed. The genus ***Arthropsis*** includes species with slightly to strongly pigmented hyphae/arthroconidia, and occasionally with a *Humicola*-synanamorph. Additionally, because of incomplete information on the presence and ultrastructure of arthroconidial connectives, van Oorschot & de Hoog (1984) found the distinction between both genera to be vague and suggested that the majority of ***Arthrographis*** species, except the type species, ***A. kalrae*** (Tewari & Macpherson) Sigler & J.W. Carmich., should be transferred to ***Arthropsis***. Later, Malloch & Sigler (1988) and Sigler *et al.* (1990) rejected this proposition. Our species adds some unusual characteristics to the above mentioned heterogeneity such as fast-growing and strongly tufted colonies in culture, and hyaline to subhyaline arthroconidia among which high variability in size is seen. However, attending to the presence of conidial connectives and the absence of differentiated conidiophores, we think this species is closer to ***Arthropsis*** than ***Arthrographis***. As it appears, the concept of ***Arthropsis*** could accommodate all the present species if conidial and mycelial pigmentation were excluded. Both pigmented and non-pigmented conidial types occur in other arthroconidial form-genera.

Fig. 2. ***Arthropsis hispanica***, IMI 353699. Fertile hyphae and arthroconidia with connectives (arrows). a. bar=20μm; b,d,f. bar=5μm; c. bar=2.5μm; e. bar=10μm.


a
b
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e
f

We propose the following key for the identification of ***Arthropsis*** species:

A key to *Arthropsis* species

1a. Colonies relatively fast-growing, with over 2 mm mean daily spread; arthroconidia hyaline to subhyaline, very variable in size . . . . ***A. hispanica***

1b. Colonies slow-growing, with less than 2 mm mean daily spread; arthroconidia tan-, orange- or brown-pigmented, uniform in size 2

2a. Colonies dark ochre-yellow; arthroconidia tan and verruculose-walled . . . . ***A. microsperma***

2b. Colonies with other colours; arthroconidia smooth-walled 3

3a. Colonies olive-green; arthroconidia brown, measuring 3.5-5 x 3-6.5 μm; *Humicola*-synanamorph . . . . ***A. truncata***

3b. Colonies light orange; arthroconidia light yellow-orange, measuring 2.5-4 x 2-3 μm; synanamorph absent . . . . ***A. cirrhata***

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LEPTODONTIDIUM ORCHIDICOLA (MYCELIUM RADICIS ATROVIRENS COMPLEX): ASPECTS OF ITS CONIDIOGENESIS AND ECOLOGY

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ABSTRACT

The Mycelium radicis atrovirens complex is a group of usually sterile hyphomycetes associated with the roots of plants growing in cool, humus-rich soils. Leptodontidium orchidicola is a relatively common, but poorly known, species in this complex. The cultural and vegetative morphology of L. orchidicola make it superficially similar to Phialocephala fortinii but differences are discernible at the microscopic level. We have obtained in pure culture several sporulating strains from alpine habitats in Alberta and have observed conidiogenesis using light and scanning electron microscopy. Observations indicate that the single-celled conidia develop blastically at non-specific loci along the lateral or terminal walls of conidiogenous hyphae. Mature conidia are variable in shape and may be sessile or short-stalked. Secondary conidia often develop blastically from the distal end of undehisced primary conidia. When grown in axenic culture with native host plants in the genera Picea, Betula and Potentilla, the fungus penetrated and colonized epidermal and cortical cells but did not cause any discernible pathogenic effects.

KEY WORDS: Mycelium radicis atrovirens; Leptodontidium; root endophyte; taxonomy.

INTRODUCTION

Dematiaceous fungi are commonly isolated from roots of plants growing in cool, humus-rich soils (Wang and Wilcox, 1985; Currah et al., 1987; Stoyke and Currah, 1991; Stoyke et al., 1992; Currah and Tsuneda, 1993). Many of these fungi are sterile or produce inconspicuous conidiogenous cells and conidia that are easily overlooked. Melin (1922) grouped these dematiaceous root associates under the name Mycelium radicis atrovirens (MRA). Three MRA taxa

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(Phialophora finlandia, Chloridium paucisporum, and Phialocephala fortinii) were described by Wang and Wilcox (1985) and a fourth (Leptodontidium orchidicola Sigler and Currah) was described by Currah et al. (1987).

The genus Leptodontidium de Hoog encompasses dematiaceous fungi that produce conidia in a more or less sympodial order at the apex of conidiogenous cells (de Hoog, 1977; 1979). The type specimen of L. orchidicola was derived from an isolate from the root of a native Alberta orchid, Platanthera hyperborea (L.) Lindl. This fungus has been reported from the mycorrhizas of a wide range of terrestrial species of Orchidaceae. Ultrastructurally, L. orchidicola has a simple septum with single central pore flanked on either side by Woronin bodies which indicates that it is ascomycetous (Currah and Sherburne, 1992). Currah et al. (1987) noted that among the species of Leptodontidium, conidium development in L. orchidicola is most similar to L. boreale and L. obscurum. Phialocephala fortinii resembles L. orchidicola in cultural (refer to Figs. 1 and 2) and vegetative morphology but conidiogenesis in the former involves incubation in the cold for about 3 months and formation of phialides with the subsequent release of dimorphic conidia. The vegetative and reproductive morphology of P. fortinii has been characterized by Currah and Tsuneda (1993) but similar work with L. orchidicola has not been done.

The objectives of this study were to: (1) characterize conidiogenesis of L. orchidicola using light and scanning electron microscopy; (2) make an initial assessment of its ecological niche by observing its effect on some host plant species when grown together in axenic culture.

MATERIALS AND METHODS

Provenance for the strains of L. orchidicola is provided in Table 1. Strains were grown on corn meal agar (CMA) at 23 °C in a dark incubator. Specimens from 2 strains (UAMH 5422 and F-AaN1a) were prepared for SEM following the procedure of Currah and Tsuneda (1993) and examined with a Cambridge Stereoscan SEM. Slide cultures were also prepared and incubated at 23 °C in the dark. Lactofuchsin-stained mounts of the slide cultures and of fresh pieces of fungal mycelium were examined with phase contrast and Nomarski Interference microscopy.

Seeds of Potentilla fruticosa L., and Betula pumila L. collected from the treeline in Cadomin, Alberta, and of Picea glauca (Moench) Voss collected from the University of Alberta campus were surface sterilized with a 20% solution of commercial bleach, rinsed 3 times with sterile distilled water, plated onto tap water agar (TWA) media in petri plates, and allowed to germinate at room temperature. Seedlings were transplanted into test tubes containing TWA and inoculated with the strain F-AaN1A. Some seedlings were left uninoculated as controls. The roots were harvested at 46 to 88 days, cleared with KOH, stained with chlorazol black, and examined under light microscope. The production of polyphenol oxidases was tested by putting plugs of mycelia from 4-week old cultures on tannic acid media (Davidson et al., 1938) and reading the reaction within 24 hours.

Table 1. Strains of L. orchidicola used in the study:

Strain	Host	Location
UAMH 5422	Platanthera hyperborea (L.) Lindl.	Devonian Botanic Garden, AB
UAMH 5420	Coeloglossum viride (L.) Hartm.	Devonian Botanic Garden, AB
F-AaN1A	Artemisia norvegica Fries	Cadomin, AB
F-CxN1A	Carex sp.	Cadomin, AB
F-PsN4A	Pedicularis bracteosa Benth.	Cadomin, AB
Z107.Rh.a	Corallorhiza trifida Chatelain	Obed Summit, AB
Z63.NR.2a	Spiranthes lacera (Rafinesque) Rafinesque	Whiteshell Provincial Forest, MB
Z45.OR.a(2)	Piperia unalascensis (Spreng.) Rydb.	West Castle River Falls, AB

RESULTS AND DISCUSSION

Light and scanning electron microscopic observations of the eight isolates of L. orchidicola indicate that single-celled conidia develop blastically in an apparently random pattern along the lateral and terminal walls of hyaline or pigmented conidiogenous hyphae (Figs. 3-13). Swollen or unswollen conidiogenous cells may also occur on the same hyphae or on short lateral branches (Fig. 9). Lateral conidia are mostly solitary (Figs. 3-11) and terminal conidia may also be solitary (Fig. 13) but are often in clusters produced sympodially (Figs. 3-5, 8, 9 and 12). The production of solitary lateral conidia on conidiogenous hyphae is a characteristic of L. orchidicola and makes this species distinct from others in the genus (Currah et al., 1987). In the early stage of conidiogenesis, lateral conidia are observed more often than the terminal sympodial type. Strains that produce few conidia, i.e., UAMH 5420, F-PsN4A, and Z45.OR.a(2), rarely form clusters of terminal sympodial conidia whereas strains that sporulate more abundantly, i.e., Z63.NR.2A, UAMH 5422, and Z107.Rh.a, often produce clusters of terminal sympodial conidia. As observed in slide cultures, the onset of conidiogenesis in these more prolifically sporulating isolates is within 7 to 9 days.

Mature conidia are 1 - 3 x 3 - 6 μm and may be globose, subglobose, ellipsoidal, oval, ovate, obovate, pyriform, clavate, or spathulate (Figs. 3-13). Each one of the isolates of L. orchidicola exhibits most or all of the different shapes. However, a particular shape can predominate in some isolates, e.g., the type UAMH 5422 has mostly pyriform (Figs. 3 and 7) whereas F-CxN1A most often has globose to subglobose conidia (Figs. 4, 6, and 9). The conidia are mostly sessile but some have short stalks (Fig. 10). Some conidia are able to form secondary spores (Figs. 3, 6 and 7). These are formed blastically, usually on the apex of existing conidia, and are morphologically similar to the parent conidium.

The liberation of conidia may be schizolytic or by disintegration of the stalk or part of the subtending structure (Fig. 13) leaving indistinct scars. Detached conidia were rare; this is another characteristic of *L. orchidicola* which distinguishes it from other species of *Leptodontidium* (Currah et al., 1987).

Conidiogenesis in *Leptodontidium* is similar to that of *Rhinocladiella* Nannf. *sensu stricto*, *Acrodontium* de Hoog, and *Ramichloridium* Stahel ex de Hoog but the conidia of the latter genera are borne on denticles (de Hoog, 1977). *Leptodontidium aciculare* Rao and de Hoog is the only reported species of the genus which produces conidia on minute denticles but is different from the above-mentioned genera on the basis of its formation of hyaline and often intercalary fertile apparatus in later transfers (Rao and de Hoog, 1986).

In axenic culture, *L. orchidicola* formed associations with the roots of seedlings from three different plant taxa studied. *Leptodontidium orchidicola* invaded the proximal region of the roots, specifically the cortical and epidermal areas. A network of intra- and intercellular hyphae formed throughout the epidermal and cortical areas of *Picea glauca* roots after 46 days. With seedlings of *Potentilla fruticosa*, intracortical branched, swollen and lobed fungal cells were observed after 54 days (Fig. 14). In *Betula pumila* intracellular sclerotia filled some cortical cells within 64 days (Fig 15). These structures formed by *L. orchidicola* on the roots of *P. glauca*, *P. fruticosa*, and *B. pumila* were morphologically similar

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Figs. 1-9. Figs. 1 and 2. Photographs showing the cultural morphology of *L. orchidicola* grown on cornmeal agar (CMA) at 23 °C. 1. Top view. 2. A view of the same culture from the bottom. The culture is plane, olive brown, with sparse grayish aerial mycelium, greenish black from below, and its hyphal mat displaying concentric zonation. Isolate F-AaN1A, 11 weeks. x0.83. Figs. 3-9. Phase contrast photographs of conidiogenous hyphae of *L. orchidicola*. Scale bar = 6 μm. 3. Terminal and lateral, pyriform, clavate, obovate, and subglobose, conidia of a prolifically sporulating isolate. Arrowheads point to 2 secondary conidia. UAMH 5422. 4. Lateral and clusters of terminal, mostly globose, conidia on a conidiogenous hypha and short lateral branch. F-CxN1A. 5. Conidiogenous hypha with lateral solitary conidia and a terminal cluster of conidia arising sympodially. Note the different shapes of conidia, e.g., oval, subglobose, clavate, ellipsoidal, and ovate. UAMH 5422. 6. Conidiogenous hypha showing 3 secondary conidia (arrowhead). F-CxN1A. 7. Lateral solitary conidia with one young secondary conidium (arrowhead). UAMH 5422. 8. Conidiogenous hyphae with lateral conidia and a short lateral branch bearing terminal conidia. Z63.NR.2a. 9. Conidiogenous hypha with globose and subglobose lateral conidia and a short lateral branch composed of swollen cells with apical cluster of conidia. F-CxN1A.

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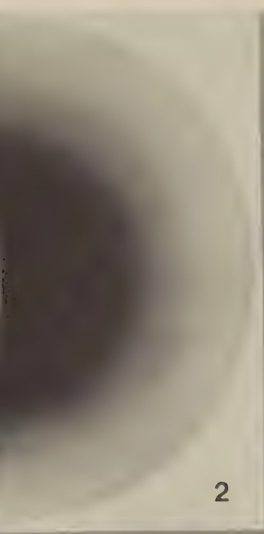
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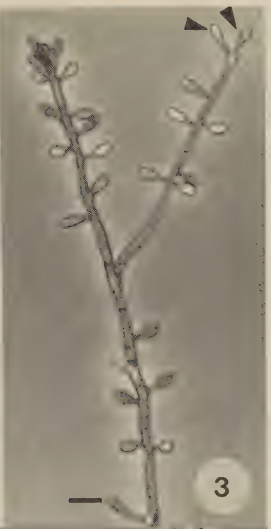
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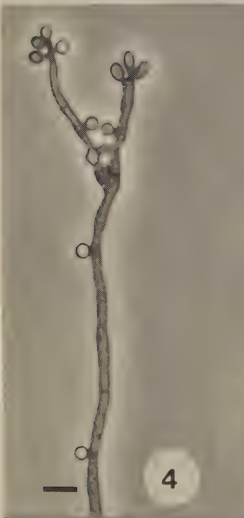
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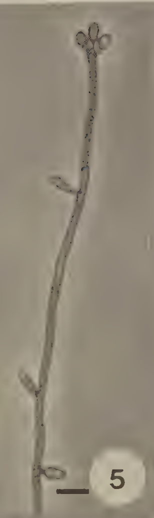
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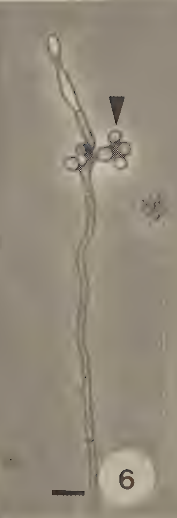
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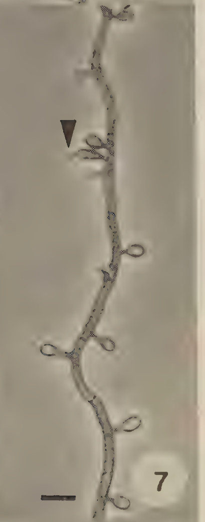
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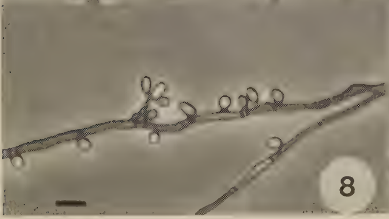
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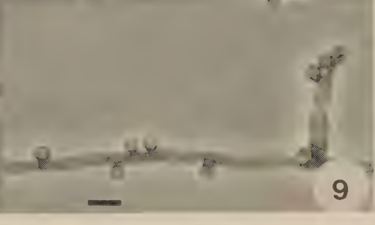
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to those formed by P. fortinii on the roots of Menziesia ferruginea as reported by Stoyke and Currah (1993). The presence of L. orchidicola in and on the roots did not inhibit root elongation and it did not have any apparent effect on seedling growth and survival. Currah et al. (1990) observed no indication of pathogenicity in orchids colonized by this root endophyte in nature.

Leptodontidium orchidicola produces polyphenol oxidases, the group of enzymes produced by white rot fungi which are involved in the breakdown of lignin. The presence of these enzymes is manifested by a dark brown to almost black zone around the plug of fungal mycelium on tannic acid medium within 24 hours (Davidson et al., 1938). Hutchison (1990) reviewed the possible ecological significance of polyphenol oxidase production in fungi, particularly laccase. Besides lignin breakdown, an indicator of potential saprobic ability, it could also function in confering resistance to antifungal phenolic compounds. Such compounds are apparently found in the humus layer of certain soils and also produced by the roots of trees as defense barriers. The aforementioned significance of polyphenol oxidase is in agreement with the report of Currah and Tsuneda (1993) regarding the relationship of polyphenol oxidase production in P. fortinii and its specialized niche as a root-dwelling fungus. Since they are both commonly isolated from roots of plants in alpine and subalpine habitats, L. orchidicola and P. fortinii may share a similar ecological niche.

ACKNOWLEDGEMENTS

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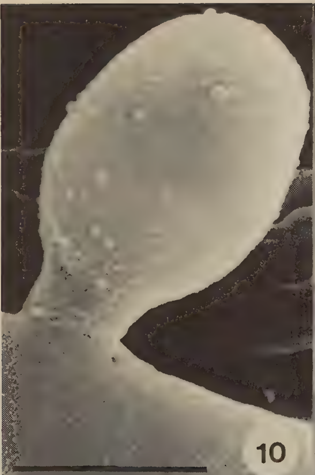
Figs. 10-15. Figs. 10-13. SEM micrographs showing lateral and terminal conidia of L. orchidicola. Scale bar = 2 μm. 10. Solitary, oval lateral conidium with short stalk. F-AaN1A. 11. Solitary, sessile, pyriform lateral conidium. F-AaN1A. 12. Terminal conidia produced sympodially arising in an apical cluster of three conidia. 13. Solitary terminal conidium with its subtending structure starting to disintegrate. F-AaN1A. UAMH 5422. Figs. 14 and 15. L. orchidicola on root systems in axenic culture. Scale bar = 6 μm. 14. Root cells of P. fruticosa showing intracortical branched, swollen and lobed fungal cells (arrow). 15. Intracellular sclerotia formed by L. orchidicola in root of B. pumila.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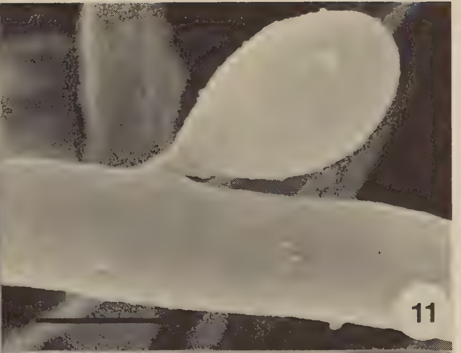
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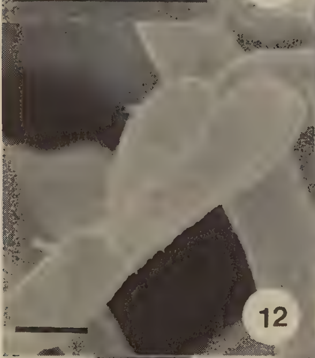
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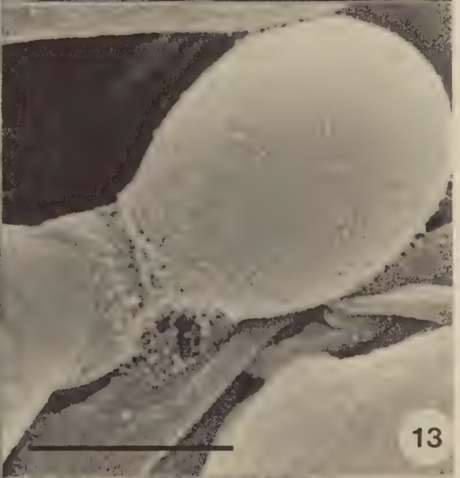
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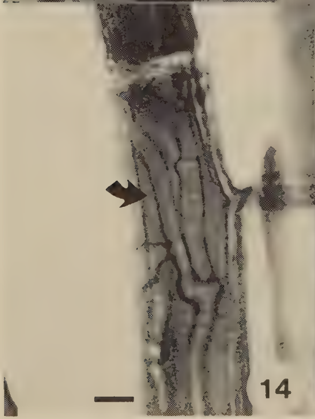
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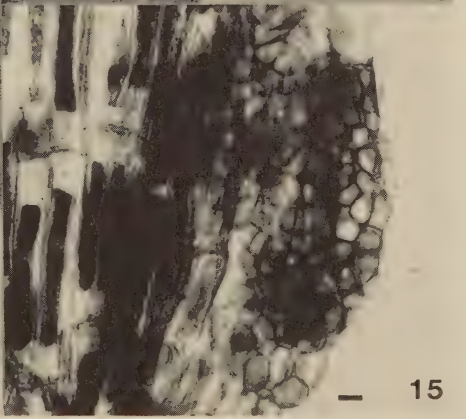
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MYCOTAXON

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PHANEROCHAETE ANDREAE SP. NOV. (APHYLLOPHORALES, BASIDIOMYCOTINA), FROM THE CANARY ISLANDS

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ABSTRACT

A new species, *Phanerochaete andreae*, found in the Canary Islands, is described. The species is characterized by broad, mostly encrusted, subicular hyphae, a subhymenium with textura intricata-porrecta, large basidia, and absence of cystidia.

Key words: Fungi, *Phanerochaete andreae* sp. nov., Aphyllophorales, Canary Islands.

INTRODUCTION

In studies of Aphyllophorales of the Canary Islands, a new species of *Phanerochaete* was discovered. It is described below.

MATERIALS AND METHODS

An Olympus BH-2 microscope was used for microscopic observations. The illustrations were made with the aid of a drawing tube. The reagents used were Melzer's, KOH (10%), and distilled water. The color of the basidiome is indicated using Kelly and Judd (1976).

Phanerochaete andreae Burdsall, E. Beltran-Tejera & J.L. Rodriguez-Armas sp. nov. (Fig. 1)

Etymology: *Andreae alterius auctorum* (J.L. Rodriguez-Armas) *filio oblata.*

Basidioma effuso, usque ad 500 (-600) μm crassum, pallido-ochra, laeve in hymeniali superficie; hyphis subiculi 7-8 (-12) μm diam, generaliter incrustatis, sine fibulis; cystidiis absentibus, basidiis 43-53.7 longis X 4.8-7.2 μm latis; basidiosporis 7.8-9.3 μm longis X 4.5-6.2 μm latis. ***Holotypus:*** *habitat in lignosis reliquiis Cisti monspeliensis (Fayo-Ericion arboreae), in loco Cherelepin, circa Llanos de Crispin, Parque Nacional de Garajonay, ad 1200 m supra mare, in Iunonia Minore (Insula Gomeradicta), Isles Canarias; lecta ab E. Beltran-Tejera, 5.XII.1987. In Herbario TFC Mic. no. 5761 conservatus (Isotypus in Herbario CFMR).*

Basidiocarp broadly effuse, not cracked, 500 (-600) μm thick, smooth, crustaceous, orange-yellow or yellowish brown (73. p. OY); margin not differentiated from fertile area, or fibrillose and light yellow.

Hyphal system monomitic. **Subiculum** a *textura intricata*, hyphae 7-9 (-12) μm diam, with wall thickening (1.2-1.8 μm), hyaline, frequently branched, usually nearly right angels, simple septate, or with single or verticillate clamps; near subhymenium hyphae arranged in a loose *textura intricata*, encrusted with fine granules; near substrate tightly agglutinated. **Subhymenium** a compact *textura intricata-porrecta*, hyphae (4-) 5.7-6.7 μm diam, thin walled, hyaline, smooth, rarely encrusted. **Cystidia** lacking. **Basidia** cylindrical-clavate, simple septate at base, 4-sterigmate, 43-54 X 5-7 μm, sterigmata up to 6.5 μm long. **Basidiospores** ellipsoid to broadly ellipsoid, slightly depressed on one side, thin walled, smooth, hyaline, 7.5-9.5 X 4.5-6 μm, negative in Melzer's reagent.

Habitat: On decayed wood of *Cistus monspeliensis*, in fayal-brezal forest (*Fayo-Ericion arboreae*); very humid, with abundant lichen and bryophyte epiphytes, at 1200 m.

Distribution: Known only from the Canary Islands. Gomera: Garajonay National Park (loc. Cherelepin).

Specimen examined: Holotype, cited above.

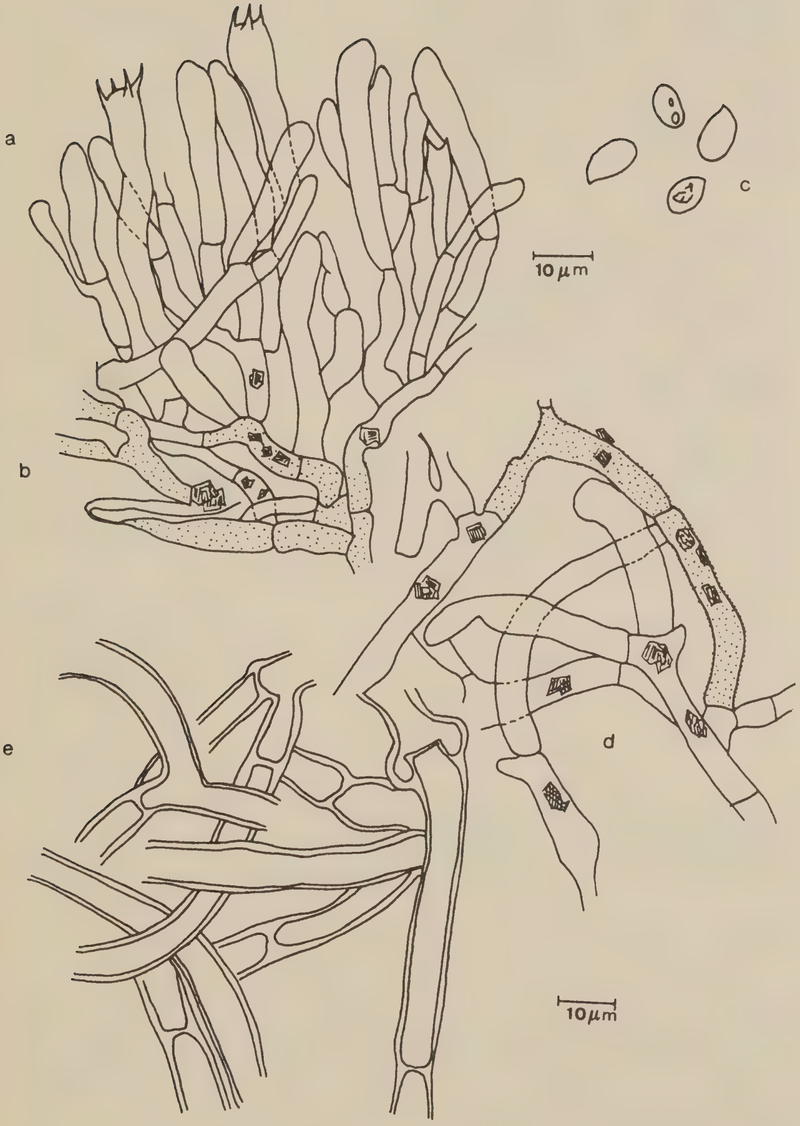

Fig. 1.-*Phanerochaete andreae*

a. Section through hymenium; b. subhymenium; c. spores; d. subicular hyphae near subhymenium; e. subicular hyphae near substrate.

REMARKS: *Because it lacks cystidia, P. andreae* belongs in subgenus *Phanericium* Parm. of *Phanerochaete*. It is distinguished by its broad subicular hyphae, mostly encrusted, subhymenium of a textura intricata-porrecta and large basidia. It is closely related to *Phanerochaete bubalina* Burdsall, also known only from the Canary Islands (Tenerife), and *P. aurata* (Bourd. & Galzin) Burdsall, from France and South Africa.

Phanerochaete bubalina differs from *P. andreae* in its thinner, grayish yellow basidiome, its smooth subicular hyphae mostly less than 6 μm diam, with slight wall thickening; by subhymenium with textura porrecta of short celled narrow hyphae (2.5-3.5 μm); and in smaller basidia (30-42 X 7-9 μm). The hymenial surface of *P. bubalina* also differs in its nearly smooth hymenial surface with scattered small tufts of *Hyphodontia*-like teeth.

Phanerochaete *aurata* possesses non agglutinated subicular hyphae near the substrate; a subhymenium of textura porrecta, short celled, narrow hyphae (4-5 μm); and smaller basidia (25-40 X 6-8.5 μm), with sterigmata 3-4 μm long. The basidiome is frequently less than 300 μm thick.

However, the basidiospores of the three species are nearly similar in shape and size, though in *P. bubalina* they tend to be slightly larger (8.5-9.5 [-12] X 5.5-6.5 [-7] μm).

ACKNOWLEDGMENT

We thank the Direccion General de Investigacion Cientifica y Tecnica (DGICYT) for financial support through the project PB-87/1004, and Dr. F. Gonzalez Luis for the corrections to the Latin text.

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MYCOTAXON

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GAUTIERIA SINENSIS SP. NOV. (GASTEROMYCETES) FROM CHINA

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Gautieria sinensis Ying from Guizhou province is the second member of the Gautieriales to be reported from China. *Gautieria chengdensis* Ying was described in 1984. The new species is characterized by the rather small gastrocarp, blackish gleba, minute glebal chambers, and large spores with 3-5 longitudinal ribs, as well as interwoven and slightly gelatinized tissues of the peridium.

KEY WORDS: *Gautieria sinensis*, Gautieriaceae, Gautieriales

Gautieria sinensis Ying, sp. nov. (Fig. 1-7)

Gasterocarpus subglobosus 1.2 cm latus, albidus in vivo, brunneus in sicco praeter basim, basis sterilis pulvinata, albida, rhizomorpha basilaris nulla. Peridium 184-366 μm crassium, ex hyphis textis subhyalinis et leviter gelatinosis, 7.5-9.0 μm crassis composita. Gleba subnigra in sicco, locelli parvi; 3-5 in mm, subrotundi vel irregulariter lbyrinthini. Columella tenuiter dendroidea. Trama leviter gelatinosa, 90-146 μm crassa, ex hyphis hyalinis et septatis composita. Fibula nulla.

Sporae 18-27 (-30.6) X (10-) 11.7-14.4 μm, umbrinae, ellipsoideae vel latae fusiformes, apicibus obtusae, pedicellatae ad basin, costis longitudinalibus 3-5. Basidia 10.8-27 X 8.1-10.8 μm, 2-sporogena, subglobosa vel subclavata. Cystidia non visa.

HABITAT: Solitaria ad terram in silvis frondosis.

HOLOTYPUS: China, Guizhou Provinica, Daozhen urbs, 19. VII. 1988. YING Jian-zhe, LI Yu, et ZONG Yi-chen 456 (HMAS 61236)

Gastrocarp subglobose, 1.2 cm broad, whitish, becoming brown when dry, except for pulvinate sterile base, without a basal rhizomorph. Peridium 184-366 μm thick in section, composed of interwoven, subhyaline and slightly gelatinized hyphae, 7.5-9.0 μm wide, with granular contents. Gleba blackish when dried, filled with spores, appearing compact, chambers minute, 3-5 per mm, nearly rounded or irregularly labyrinthine. Columella sparsely branched. Tramal plates somewhat gelatinized, 90-146 μm thick,

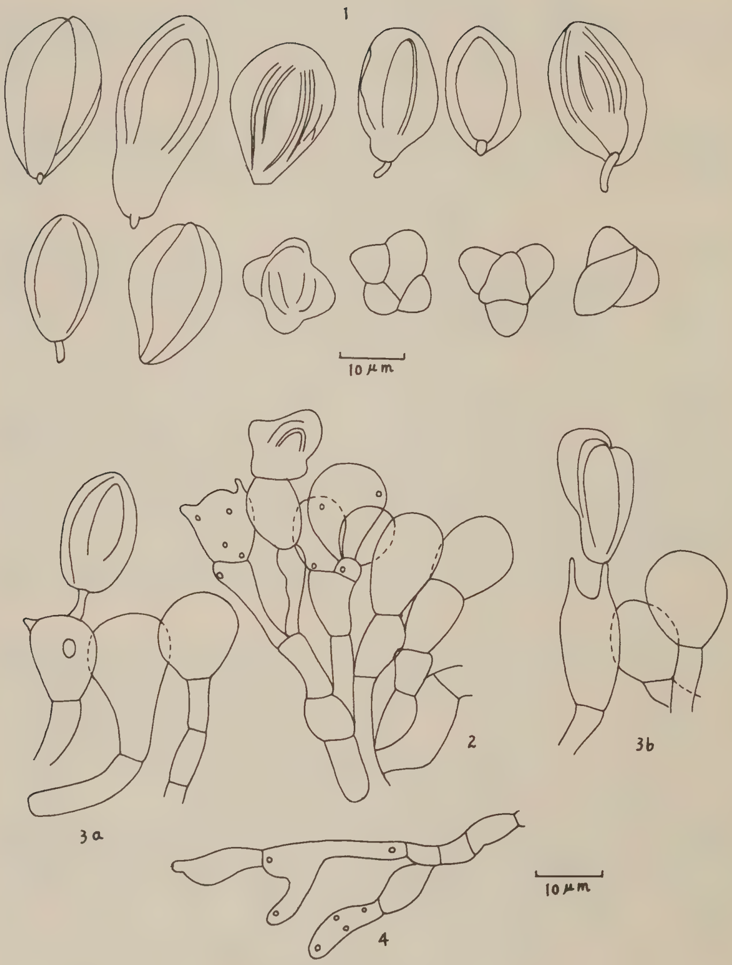

Fig. 1–4. *Gautieria sinensis* sp. nov. (HMAS 61236)
1. face view and transverse view of basidiospores
2. hymenium, showing basidia and sterile cells
3. basidia with 2–spores
4. hyphae of tramal plate

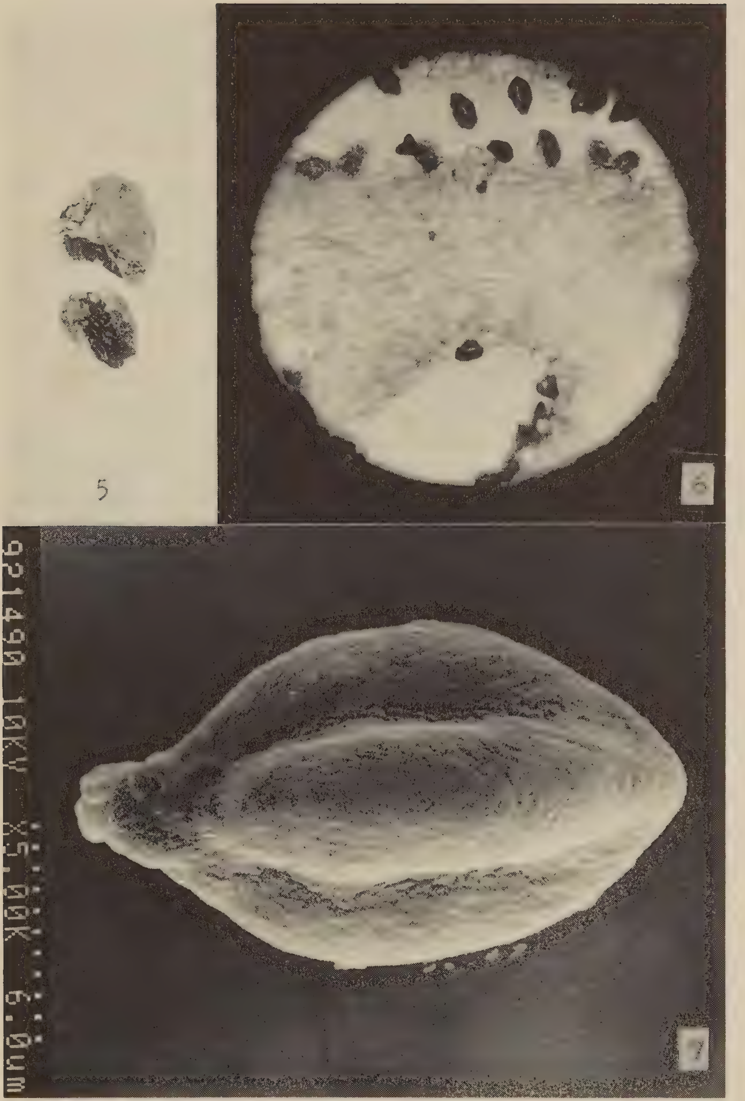
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Fig. 5–7. *Gautieria sinensis* (HMAS 61236)
5. gastrocarp (ca. natural size)
6. transverse free hand section showing gelatinized tramal plate, hymenium and basidiospores (X 1560)
7. SEM of basidiospore

of hyaline, septate hyphae. Hymenium 19. 8 – 30. 6 μm thick, of basidia and young basidia – like sterile cells.

Spores 18 – 27 (– 30. 6) X (10 –) 11. 7 – 14. 4 μm, dark brown in 50% aqueous lactic acid or in Melzer's Reagent, ellipsoid or broadly fusiform, apex somewhat rounded, base short pedicelled, pedicel up to 3. 6 μm long, mostly with 4 longitudinal ribs, rarely with 3 or 5 ribs. Basidia 10. 8 – 27 X 8. 1 – 10. 8 μm, subglobose to subclavate. No cystidia were found.

HABITAT: Solitary on ground in frondose woods.

HOLOTYPE: China, Guizhou province, Daozhen city, 19. VII. 1988. YING Jian – zhe, LI Yu, and ZONG Yi – chen 456 (HMAS 61236)

The rather small carpophore, blackish gleba, minute glebal chambers and large spores with 3 – 5 longitudinal ribs, as well as the interwoven and slightly gelatinized tissues of the peridium separate the new species from others of this genus.

ACKNOWLEDGEMENTS

The author wishes to express her thanks to Prof. Richard P. Korf, Cornell University, for his critical review of this manuscript, to Ms. YUNG Lan – cui and Mr. DONG Guang – jun for taking pictures of specimens and scanning electron micrographs of basidiospores of the new species, respectively, MS. HANG Zhe – fang for inking the line drawings, and Mr. SUN Shu – xiao for typing the final copy.

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MYCOTAXON

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NEW AND NOTEWORTHY AGARICS FROM CHINA

I. NEW SPECIES OF CHAMAEOTA

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Chamaeota (W. G. Smith.) Earle, one of the genera belonging to the Pluteaceae, is different from both *Volvariella* and *Pluteus* in characters of its veil. Its delimination is on the basis of these diagnostic features: pileus fleshy, discrete from the stipe, lamellae free, spore print pink or salmon; stipe central, fleshy; veil persistent, forming an annulus; epicutis cylindric - filamentous; hyphae without clamp connections; putrescent; terrestrial or lignicolus (Donk 1962, Horak 1968, Kauffman 1918, Singer 1986).

During the course of studies on agaric collections from Zhejiang province, a new species of *Chamaeota* was found. The new species *Chamaeota sinica*, is delimited mainly from *Chamaeota dextrinoidespora* Bi by its color, larger spores, and different cheilocystidia. Thus far there are only two species of *Chamaeota described* in China.

Specimens examined are deposited in the Herbarium Mycologicum Instituti Microbiologici, Academiae Sinicae (HMAS), Beijing, China. Color terminology follows that of Ridgway (1912).

KEY WORDS: *Chamaeota sinica*, Pluteaceae.

Chamaeota sinica Ying, sp. nov. (Fig. 1 - 8).

Hace species affinis *Chamaeotae dextrinoidesporae* a qua coloribus frutificationorum, sporis et cheilocystidis differt. Pileus 2.5 - 6 cm latus, convexus, umbonatus, in vivo vinaceo - cinnamomeus (Vinaceous Cinnamon - R. XXIX), in sicco badius (Verona Brown - R. XXIX), umbo atrobadius, velutinus. Contextus tennuis, 1.5 - 2.5 mm crassus, incarnatus, in sicco vinaceo - babalinus (Vinaceous - Buff - R. XL), odore et sapore vix manifestis. Lamellae librae, subdensae, roseae (Buff Pink - Japan Rose - R. XXVIII), ventricosae usque ad 5 mm crassas, margine plane vel fimbriate sub lente. Stipe centralis, 6 - 9 cm longus, 0.3 - 0.6 cm crassus, aequalis vel leviter incrassatus ad basin, concolorus pileo, velutinus et

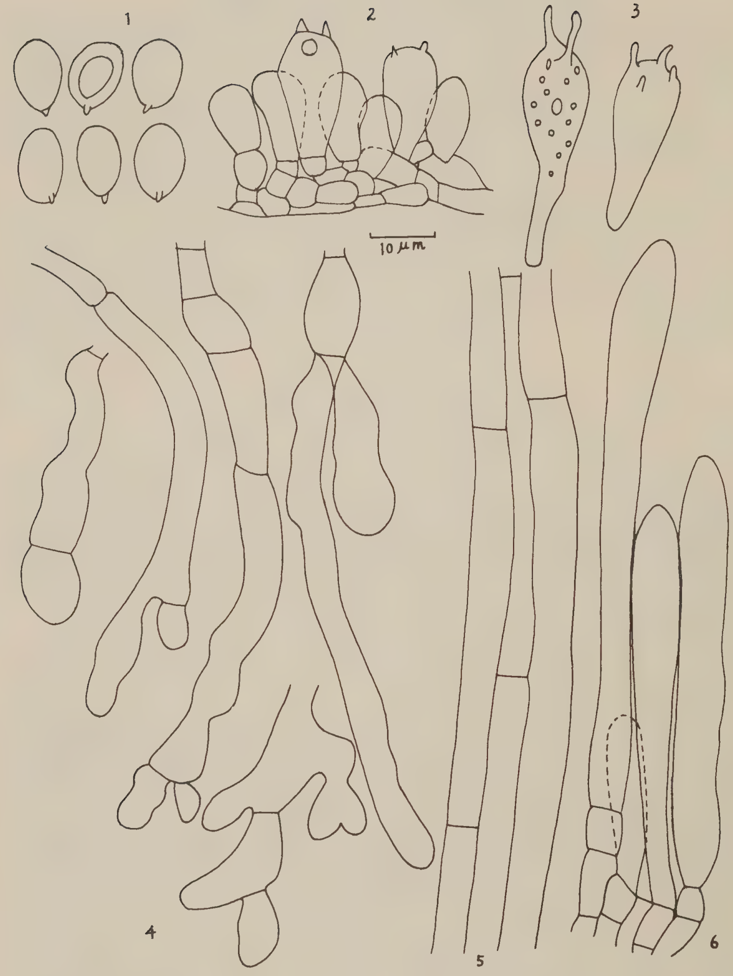

Fig. 1–6: *Chamaeota sinica* sp. nov. (HMAS 60647)
1. basidiospores 2. hymenium 3. basidia
4. cheilocystidia 5. hyphae of pileus epicutis
6. elements of hairs on pileus

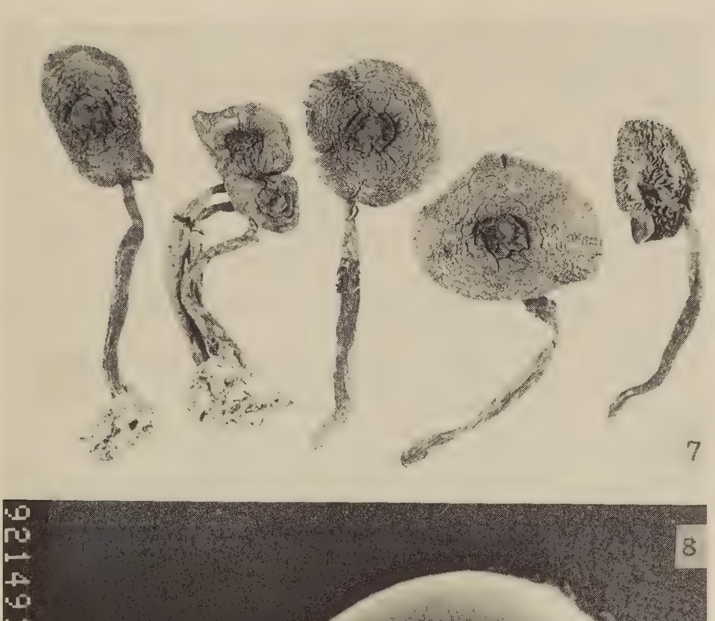
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Fig. 7–8. *Chamaeota sinica* (HMAS 60647)

7. basidiomata showing superior annulus (ca. 1/2 natural size)
8. SEM of basidiospore

striatus, fibrosus, carvus, basi mycelia dilute vinosa (Pale Vinaceous – R. XXVII) praedita. Annulus superus, membranaceus, supra roseum ab sporis, subliter velutino et pileo concoloris. Massae sporis rosae. Sporae submicroscopio hyalinae in 2.5% KOH solutione, rubello – brunneae in Melzers solutione, leves, ellipsoideae vel ovoideae, 7.2 – 12.6 X 5.4 – 9.0 μm, guttulatae. Basidia 2 – 4 sporogena, clavata, 23 – 36 X 9 – 10.8 μm. Pleurocystidia nulla. Cheilocystidia longata, septata, aliquot leviter ampliata vel ramosa, hyalina vel brunnea, 31 – 90 X 4.5 – 12.6 μm. Epicutis pilei ex hyphis cylindricis, hyalinis, septatis, 3.6 – 10.8 μm crassis composita. Velveta pilei ex hyphis brunneis 65 – 139 X 5.4 – 7.2 μm composita. Epicutis et velveta stipis similis pileo. Hyphae fibulis nullis.

HABITAT: Caespitosus vel gregarius ad terram in frutice *Rhododendri.*

HOLOTYPUS: China, Zhejiang provinca, Hangzhou urbs, 15. V. 1990, WEN Ju – fang 905 (HMAS 60647).

Pileus 2.5 – 6 cm broad, convex, umbonate, vinaceous – cinnamon (R. – XXIX) becoming Verona Brown (R. – XXIX) when dry, umbo darker, surface velvety. Context thin, 1.5 – 2.5 mm thick, flesh colored, Vinaceous Buff (R. – XL) on drying, smell and taste not distinctive. Lamellae free, pinkish when fresh, drying Buff Pink to Japan Rose (R. – XXVIII), close, ventricose, up to 5 mm broad, edge even or fimbrillate under a lense. Stipe central, 6 – 9 cm long, 0.3 – 0.6 cm thick, equal or slightly thickened at the base, concolourous with pileus, velutinate and striate, fibrous, hollow, with pale vinaceous mycelia present at base. Annulus superiour, membranous, upper surface pink from the spores, underneath velutinus and concolorous with pileus.

Spore mass between Buff – Pink and Japan Rose (R. – XXVIII) under the microscope, hyaline in 2.5% KOH solution, reddish brown in Melzers Reagent, smooth, ellipsoid or ovoid, 7.2 – 12.6 X 5.4 – 9.0 μm, uniguttulate. Basidia 2 – spored, rarely 4 – spored, clavate, 23 – 36 X 9 – 10.8 μm. Pleurocystidia none. Cheilocystidia composed of long, septate cells, some slightly enlarged or branched at the apex, 31 – 90 X 4.5 – 12.6 μm, hyaline or brown, wall thin or slightly thickened. Epicutis of pileus composed of cylindric, subhyaline, septate hyphae 3.6 – 10.8 μm wide, and hairs of brown hyphae, 65 – 139 X 5.4 – 7.2 μm. Epicutis of stipes with hyphae hyaline or subhyaline, septate, 4.5 – 7.2 μm wide; hairs similar to those of pileus, 52 – 162 X 5.4 – 9.0 μm.

HABITAT : Caespitose or gregarious on soil in bushes of *Rhododendron.*

LOCALITY: China, Zhejiang province, Hangzhou city, 15. V. 1990. WEN Ju – fang 905 (HOLOTYPUS HMAS 60647). PARATYPI: 14. V. 1990, 904 (HMAS 59909), 16. V. 1990. 906 (HMAS 62975).

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Grateful appreciation is expressed to Research Prof. WEN Ju – fang for generously contributed field collections from 1982 onwards. Special thanks are due to Prof. Richard P. Korf, Cornell University, for his comments on the manuscript, and to the following people: Mr. DONG Guang - jun for his assistance in obtaining scanning electron micrographus, Ms. YUAN Lan - cui and HAN Zhe - fang for taking photographs of specimens and inking the line drawings respectively, Mr. SUN Shu - xiao for typing the final copy.

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MYCOTAXON

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NEW AND NOTEWORTHY AGARICS FROM CHINA

II. NEW SPECIES OF ENTOLOMA

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Based on specimens collected from Yunnan province, a new species *Entoloma yunnanense* Ying, is described and illustrated. Thoug 100 species of *Entoloma* are now known in China, no record of any species of Section *Luctuaria* (Romagn.) Sing. in subgenus *Pouzaromyces* (Pilat) Moser ex Noordeloos has been reported previously (Teng 1964, Tai 1979, Xie et al. 1986, Bi et al. 1990, Li et al. 1991, etc.) The distinctive characters of the new species are the mycenoid habit, small brown basidiocarps, the consipicuous squamulose pileus, pubescent stipe with brown strigose hairs at the base, and small spores and cheilocystidia.

The Specimen cited is deposited in the Herbarium Mycologicum Instituti Microbiologici, Academiae Sinicae (HMAS): Color terminology follows that of Ridgway. (1912).

KEY WORDS: *Entoloma yunnanense*, *Entoloma* Subgen. *Pourzaromyces*, Sect. *Luctuaria*

Entoloma yunnanense Ying, sp. nov. (Fig. 1-8)

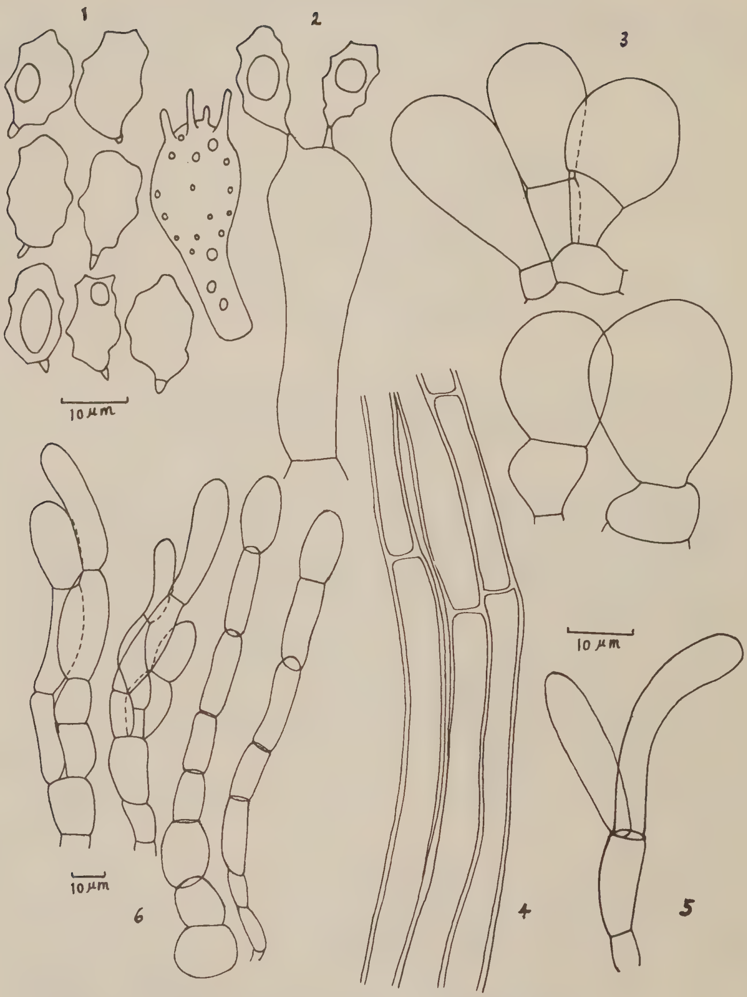
Species hace affinis *Rhodophyllo japonico* a qua differt spories minoribus, cheilocystidiis quoque brevioribus.

Pileus 0.9-1.5 cm latus, hemisphaericus vel subcampanulatus, brunneus (Pecan Brown - R. XXVIII), densissime fibrillis squamis concoloribus obtectus, squamellae erectae et fasciculatae super disco. Lamellae emerginato-subdecurrentes, pallidae brunneolae griseae. Stipes 5.5-8 X 0.2 cm, cylindricus, pileo concolor, pubescens, strigosus ad basin.

Sporae 12.6-16.2 X 7.2-10 μm, subhyalinae, 5-8 angulatae. Basidia 4-sporogena, 34-54 X 12.6-16 μm. Pleurocystidia nulla. Cheilocystidia 19.8-23.4 X 14.4-18 μm, subglobosa vel clavata. Fibulae nullae.

HABITAT: Gregarius ad terram in silvis.

HOLOTYPUS: China, Yunnan provinica, Binchuan urbs, 10. VIII. 1989. LI Yu et ZONG Yi-chen 247 (HMAS 61238).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2
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10 µm
10 µm
10 µm
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Fig. 1–6. *Entoloma yunnanense* sp. nov. (HMAS 61238)
1. basidiospores 2. basidia 3. cheilocystidia
4. hairs of stipe base 5. hairs of stipe
6. hairs of pileus
scale in 1. applies to 1–5

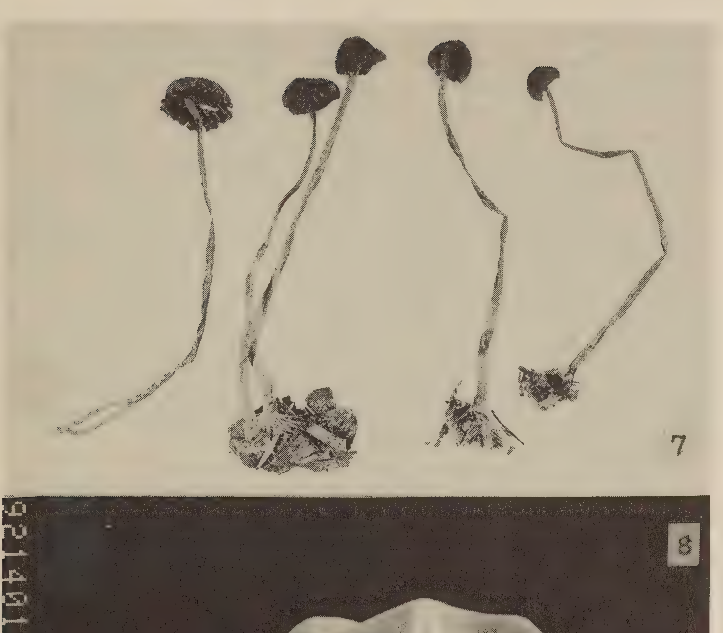
7
8
921401 10KV X7.00K 4.30µm

Fig. 7–8. *Entoloma yunnanense* (HMAS 61238)
7. basidiomata (ca. 1/2 natural size)
8. SEM of basidiospore

Mycenoid, pileus 0. 9 – 1. 5cm broad, hemispheric to subcampanulate, Pecan Brown (R. – XXVIII), densely covered all over with fibrillose squamules clustered and erect over disk, margin not striate. Context thin, pale brown, oder not distinctive. Lamellae emerginate to subdecurrent, pale Brownish Drab (R – XLV), subdistant, edge pruinose. Spore mass on lamellae pinkish brown when dry. Stipe 5. 5 – 8 X 0. 2 cm, slender, cylindric, fistulose, concolorous with pileus or paler, pubescent, strigose at base with long, radiating, pale Pecan Brown hairs.

Spores 12. 6 – 16. 2 X 7. 2 – 10. 0 μm, 5 – 8 angled in profile view, subhyaline. Basidia 4 – spored, 34 – 54 X 12. 6 – 16 μm, clavate, clampless. Pleurocystidia absent. Cheilocystidia 19. 8 – 23. 4 X 14. 4 – 18 μm, subglobose or clavate. Pileipellis a transition between a cutis and a trichoderm, composed of septate hairs, with hyphal elements 15 – 81. 4 X 12. 6 – 19. 8 μm, slightly brownish. Stipitipellis a cutis with yellowish, septate hyphae 3. 6 – 7. 2 μm wide, hairs of stipe at base strigose, composed of cylindrical, yellowish, slightly thick – walled, septate hyphae 36 – 306 X 3. 6 – 6. 3 μm; on stem, 36 – 108 X 5. 4 – 9. 0 μm thin – walled. Clamp connections absent from all tissues.

HABITAT: gregarious on ground in frondose woods.

LOCALITY: China, Yunnan province, Binchuna County, 10. VIII. 1989. LI Yu and ZONG Yi – chen 247 (HOLOTYPE, HMAS 61238).

This species belongs in the subgenus *Pouzaromyces* (Pilat) Moser ex Noordeloos (1979) Sect. *Luctuaria* (Romagn.) Sing. (Singer 1986) . It is closely related macroscopically to *Rhodophyllus japonicus* (Hongo) Hongo (= *Rhodophyllus babingtonii*(Blox.) Quel. f. *japonicus* Hongo = *Pouzarella japonica* (Hongo) Mazzer) from which it differs in its microscopic characters particularly, the smaller size of spores and cheilocystidia.

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TAXONOMY OF SOME ARGENTINE SPECIES OF SACCOBOLUS

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ABSTRACT

Nine *Saccobolus* species with 100 isolates from diverse locations of Argentina were analysed on the basis of morphological and cultural characters, using either ordination or sequential techniques. The results support the classical speciation of *Saccobolus* based on morphology of reproductive structures, and show that the nine studied species are clearly independent taxonomic entities.

Key words: *Saccobolus*, taxonomy, factor analysis, cluster analysis, Argentina.

INTRODUCTION

When Boudier (1869) established *Saccobolus*, the presence of a common mucilaginous hyaline sack around the ascospores was considered one of the major criteria. Although this mucus occurs only in a limited number of species, many authors have maintained it as the most important distinguishing character. Brummelen (1967) characterized the genus within the subfamily *Ascoboloideae* as producing clustered ascospores, relatively short and broad, clavate, truncate asci, and relatively short paraphyses.

The nine species in the current report were thoroughly studied previously for ascocarp development and cytology of the ascus (Gamundí & Ranalli, 1969; Ranalli, 1974; Ranalli & Gamundí, 1975; Ranalli & Forchiassin, 1976; Dokmetzian et al., 1986; Ranalli & González Castelain, 1994; Mouso & Ranalli, 1986; Forchiassin & Dokmetzian,1982), and for diverse phisiological purposes (Mercuri & Forchiassin, 1978; Galvagno et al., 1984; Ramos, 1994).

The use of numerical methods to solve taxonomic problems appears to be an excellent tool since the pioneering reports of Sneath & Sokal (1962), resumed later in two admirable books (Sokal & Sneath, 1963; Sneath & Sokal, 1973).

The present study aimed to find additional diagnostic characters, other than classic morphology, for a group of *Saccobolus* species, using either ordination (Factor analysis) or sequential (Cluster analysis) techniques to determine the taxonomic structure.

MATERIALS AND METHODS

Specimens examined

The *Saccobolus* species studied were (the key in brackets will be used as short-cut in Tables and Figures): *S. beckii* Heimerl (BEC), *S. citrinus* Boud & Torrend (CIT), *S. depauperatus* (Berk. & Broome) E.C.Hansen (DEP), *S. longevisporus* Ranalli & González (LON), *S. pampeanus* Dokmetzian (PAM), *S. platensis* Gamundí & Ranalli (PLA), *S. saccoboloides* (Seaver apud Dodge & Seaver) Brumm. (SAC), *S. psudodepauperatus* Gamundí & Ranalli (SEU), *S. succineus* Brumm. (SUC).
Table I shows location (place, province), substrate (dung), date of collection and herbaria number for the 100 isolates.

TABLE I. Species and isolates collected

SPECIES (KEY)	LOCATION	SUBSTRATE	DATE	BAFC#	LPS #
BEC	Campana, PBA	horse	09/71	33426	
BEC	Villa Gessell, PBA	hare	06/66	33427	
BEC	Trevelin, CHB	mara	03/63	21420	
BEC	Bariloche, RN	horse	01/87	33428	
BEC	C. San Bernardo, ST	cow	11/66	33429	
BEC	C. San Bernardo, ST	cow	09/63	22077	
BEC	Chamical, ST	horse	09/63	21527	
BEC	Q. del Chamical, ST	sheep	09/63	21526	
CIT	Agronomía, BA	cow	12/79	33430	
CIT	Gob. Castro, PBA	cow	05/83	33431	
CIT	S. de la Ventana, PBA	sheep	12/64	22324	
CIT	Col. Benítez, CHC	mule	10/67	33432	
CIT	Col. Benítez, CHC	cow	10/67	22325	
CIT	Gualeguaychú, ER	cow	01/88	33433	
CIT	Bariloche, RN	horse	01/87	33434	
CIT	Dique El Cadillal, TC	horse	06/71	24096	
CIT	Q. de Lules, TC	cow	06/71	24097	
DEP	Ezeiza, PBA	horse	05/83	33435	
DEP	Ezeiza, PBA	horse	06/81	33436	
DEP	Gob. Castro, PBA	horse	05/83	33437	
DEP	La Plata, PBA	cow	5/888		26139
DEP	S. de la Ventana, PBA	sheep	12/64	33438	
DEP	S. de la Ventana, PBA	cow	12/65	21995	
DEP	Ruta 14, ER	horse	06/81	33439	
DEP	Santa Rosa, LP	horse	03/81	33440	
DEP	Cacheuta, MZ	cow	02/08		26140
DEP	Bariloche, RN	horse	01/87	33441	
DEP	C. San Bernardo, ST	cow	11/66	33442	
DEP	C. San Bernardo, ST	cow	09/63	22080	
LON	Mar Chiquita, PBA	horse	10/62	31896	
LON	Puerto Deseado, SC	goat	10/62	33444	
LON	Puerto Deseado, SC	cow	01/62	31894	
LON	Tafí, TC	cow	10/71	33445	
LON	Tafí, TC	horse	06/71	31895	
PAM	Santa Rosa, LP	horse	09/78	29991	
PAM	Santa Rosa, LP	horse	03/81	33446	
PAM	Q. de Lules, TC	horse	06/71	29992	
PLA	Agronomía, BA	horse	10/82	33447	
PLA	Agronomía, BA	cow	06/92	33448	
PLA	Recoleta, BA	horse	6/880		26116
PLA	Ezeiza, PBA	horse	06/91	33449	
PLA	Ezeiza, PBA	horse	06/81	33450	
PLA	Gonnet, PBA	llama	10/61	21298	
PLA	La Plata, PBA	cow	02/61	21108	
PLA	Olavarría, PBA	sheep	06/66	33451	
PLA	Punta Indio, PBA	cow	10/62	33452	
PLA	San Pedro, PBA	horse	05/91	33453	
PLA	S. de la Ventana, PBA	sheep	12/64	33454	
PLA	Tandil, PBA	cow	01/90	33455	
PLA	V. Gessell, PBA	hare	06/66	33456	
PLA	Trevelin, CHB	cow	03/63	21428	
PLA	Cañada del sauce, CD	horse	09/92	33457	
PLA	Gualeguaychú, ER	cow	01/88	33458	
PLA	Villa Clara, ER	horse	05/89	33459	

PLA	Ruta 56, JJ	goat	09/63	33460
PLA	Tilcara, JJ	guanaco	08/61	21302
PLA	C. Bandurrias, NQ	sheep	11/66	22079
PLA	Hua-Hum, NQ	cow	01/62	21421
PLA	Pichi Traful, NQ	cow	01/62	33461
PLA	Ruta 40, NQ	sheep	01/62	21303
PLA	Chamical, ST	sheep	09/63	21528
PLA	A. Cabeceras, SJ	horse	02/63	33462
PLA	Barreal, SJ	mule	02/63	33463
PLA	Calingasta, SJ	horse	02/63	22080
PLA	El Salvador, SE	horse	01/62	21300
PLA	El Salvador, SE	mule	01/62	21299
PLA	Q. de Lules, TC	cow	10/71	33464
SAC	Ezeiza, PBA	horse	06/70	22327
SAC	Paraná, ER	horse	05/70	22326
SAC	Bariloche, RN	horse	01/87	33465
SAC	Recreo, SF	cow	07/70	22389
SAC	Q. de Lules, TC	cow	10/71	33466
SEU	Campana, PBA	cow	05/70	33467
SEU	Castelar, PBA	cow	08/83	33468
SEU	Ezeiza, PBA	horse	06/70	22587
SEU	Gualeguaychú, ER	horse	06/81	33469
SEU	Gualeguaychú, ER	cow	01/88	33470
SEU	Tres Perdices, ER	horse	06/81	33471
SEU	Villa Clara, ER	horse	05/89	33472
SEU	Bariloche, RN	horse	01/89	33473
SEU	Bariloche, RN	horse	01/87	33474
SEU	Bariloche, RN	cow	01/89	33475
SEU	C. San Bernardo, ST	cow	11/66	33476
SEU	Recreo, SF	horse	07/70	22589
SEU	Recreo, SF	horse	07/70	22588
SEU	Recreo, SF	cow	07/70	22591
SEU	Sauce viejo, SF	cow	07/70	22590
SUC	Agronomía, BA	horse	10/82	33477
SUC	Agronomía, BA	horse	12/79	33478
SUC	Campana, PBA	cow	06/70	22330
SUC	Castelar, PBA	cow	10/82	33480
SUC	Castelar, PBA	cow	04/82	33479
SUC	Ezeiza, PBA	horse	06/81	33481
SUC	Ezeiza, PBA	horse	06/70	22390
SUC	Ezeiza, PBA	horse	04/91	33482
SUC	G. Castro, PBA	horse	06/83	33483
SUC	Lima, PBA	cow	06/81	33484
SUC	Gualeguaychú, ER	cow	01/88	33485
SUC	Paraná, ER	horse	05/70	22329
SUC	Villa Clara, ER	cow	05/89	33486
SUC	Bariloche, RN	horse	01/87	33487

Culture media and conditions

Studies on spore germination were performed on Petri dishes filled with Bacto agar 2 %. For studies on ascocarp development, PF medium (yeast extract 0.3 %, agar 1.8 %) was dispensed in Petri dishes with a filter paper disk in it.

Incubation took place at 23 °C under continuous light.

Characters examined

Twenty five morphological and cultural characters were examined for each species. Qualitative and cultural characters were coded as shows Table II. Quantitative variables, such as asci or apothecia dimensions, were recorded as measures in µm.

TABLE II. Characters and character states

CHARACTER			No	STATES
Apothecia	colour		01	1: yellow; 2: not yellow
	diameter			
		minimum	02	measure in µm
		maximum	03	measure in µm
Asci	length			
		minimum	04	measure in µm
		maximum	05	measure in µm
	width			
		minimum	06	measure in µm
		maximum	07	measure in µm
Ascospores	colour		08	1: brown; 2: dark brown to black 3: violet
	pattern of arrangement		09	1: pattern I; 2: pattern II or III
	length			
		minimum	10	measure in µm
		maximum	11	measure in µm
	width			
		minimum	12	measure in µm
		maximum	13	measure in µm
	mucus		14	1: complet; 2: partial
Paraphyses				
	colour		15	1: yellow; 2: not yellow
	branching		16	1: allways branched; 2: branched or not
Distribution of apothecia			17	1: solitary; 2: gregarious
Germination of ascospores in AA				
	% of NaOH treatment		18	1:£ 3%; 2: ³ 4%
	time of treatment		19	1:³ 30 min; 2: < 30 min
	time for germination		20	1: 24 h; 2: 48 h; 3: > 48 h
Culture in PF				
	appearing of primordia			
		first day	21	1: £ 3 days; 2: > 3 days
		last day	22	1: £ 6 days; 2: > 6 days
	distribution of apothecia		23	1: irregular; 2: regular; 3: indifferent
	spore liberation			
		first day	24	1: £ 8 days; 2: > 8 days
		last day	25	1: £ 9 days; 2: > 9 days

Since each species examined consists of several collections, the parameters for each variable represent the records for all collections. Characters that imply intraspecific variation, i.e.: geographical location or sustrates, were excluded.

On this basis a 25 X 9 data matrix was constructed and standarized with the algoritm:

$$Y' = Y - \bar{Y} / STD$$

where $\bar{Y}$ is the mean of each variable, and STD its standard deviation .

Numerical Methods

Factor analysis.

Data matrix were computed to obtain a correlation matrix from which principal components were extracted. Orthogonal rotation (gamma = 1) of the correlations of the principal components with the original variables were performed. Estimated factor scores and Mahalanobis distances were obtained. The factor score covariance matrix, recomputed using the factor scores, serves as a check for numerical accuracy. Then, the factor scores were plotted one against the other.

Factor analysis were performed using the BMDP (Multivariate Analysis) statistical package (Dixon, 1981)

Cluster analysis

Manhattan metric distance coefficient (Rohlf & Sokal, 1965) were computed for each pair of species in the standarized data matrix, and the resulting matrices were analysed by average linkage cluster analysis (UPGMA) (Sneath & Sokal, 1973).

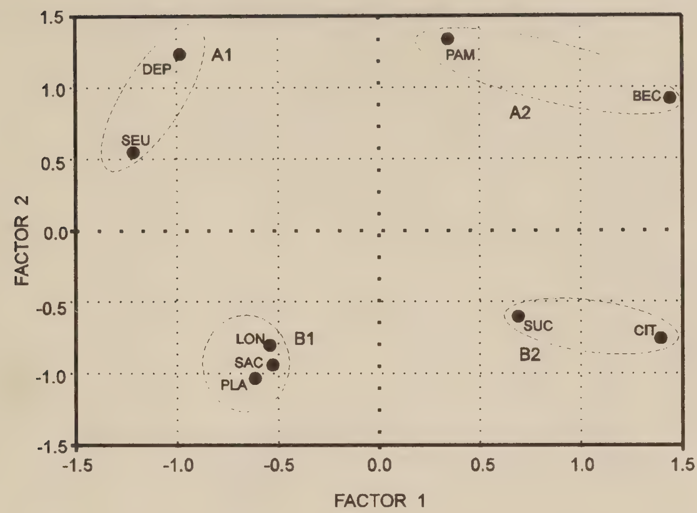
The goodness of fit of the phenogram was examined on the basis of cophenetic matrix computed from the tree matrix, with similarity matrix.

RESULTS AND DISCUSSION

Factor Analysis

The nine species of *Saccobolus* studied can be distinguished by factor analysis. The model fit the data satisfactorily since the variance explained by the first four factors was 81.4 % of the total variance (The first seven factors explain the 100 % of the total variance in the data space).

The factor 2 provides a cleary discrimination between two groups of species (A, B) (Figure 1). The colour of apothecia and paraphyses, and the spore pack characteristics loads the 78.4 % of the variance explained by factor 2 (Table III).



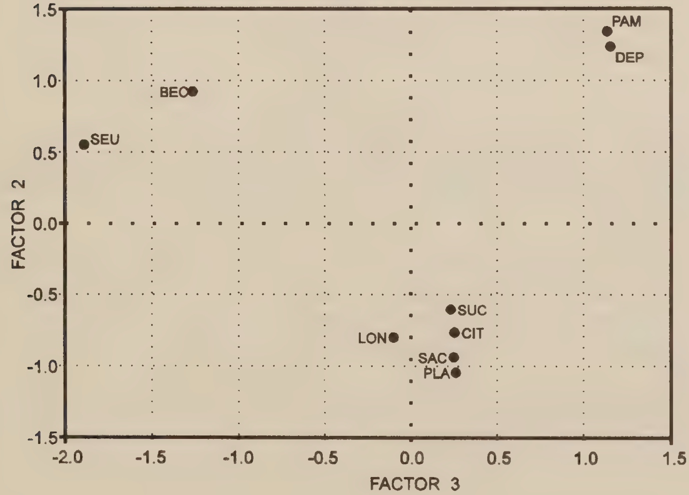


Figure 1. Factor Analysis. Factors 1,2 projection.

Figure 2. Factor Analysis. Factors 2,3 projection.

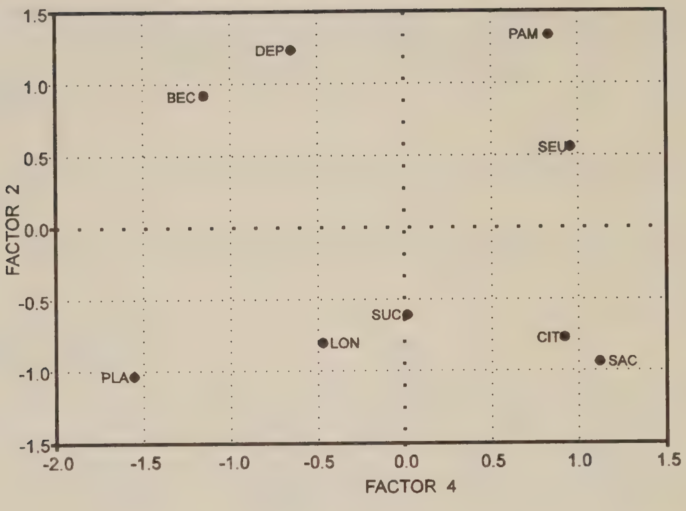


Figure 3. Factor analysis. Factors 2,4 projection.

Asci and ascospores dimensions loaded the main contribution (92.5 %) to factor 1. The plot of the two first factors (Figure 1) shows that two subgroups were separated by factor 1 from each group discriminated by factor 2 (A1-A2; B1-B2).

Factor 3, loaded by the cultural characters in PF (76.2 %), provides a sharp separation among the species of subgroups A1 and A2 (Figure 2), while the germination of ascospores characteristics loading 71 % of the variance explained by factor 4, discriminate among the species of B1 and B2 (Figure 3).
The three dimensional factor analysis graph in Figure 4 explains 68.7 % of the total variation. The four groups of species (A1-A2-B1-B2) were well separated on the graph.

TABLE III. Pattern of rotated first four factors loadings

CHARACTER No.	FACTOR1	FACTOR2	FACTOR3	FACTOR4
4	0.963			
5	0.900			
13	0.856			
10	0.807			
11	0.793			
12	0.769			
7	0.726			
6	0.675			
1		0.969		
9		0.969		
14		0.969		
15		0.969		
24			0.892	
25			0.892	
16			0.726	
21			0.707	
18				0.901
8				-0.841
17				0643
20				0.631
TOTAL VARIANCE EXPLAINED	7.605	5.173	4.392	3.181
CUMULATIVE PROPORTION OF VARIANCE	0.304	0.511	0.687	0.814

Loadings less than 0.600 were excluded from Table III. The characteristics which contribute to the variance explained less than 0.600, were: apothecial diameter (#2, #3), time of treatment of ascospores (#19), appearing of primordia (#22), and distribution of apothecia in culture (#23).

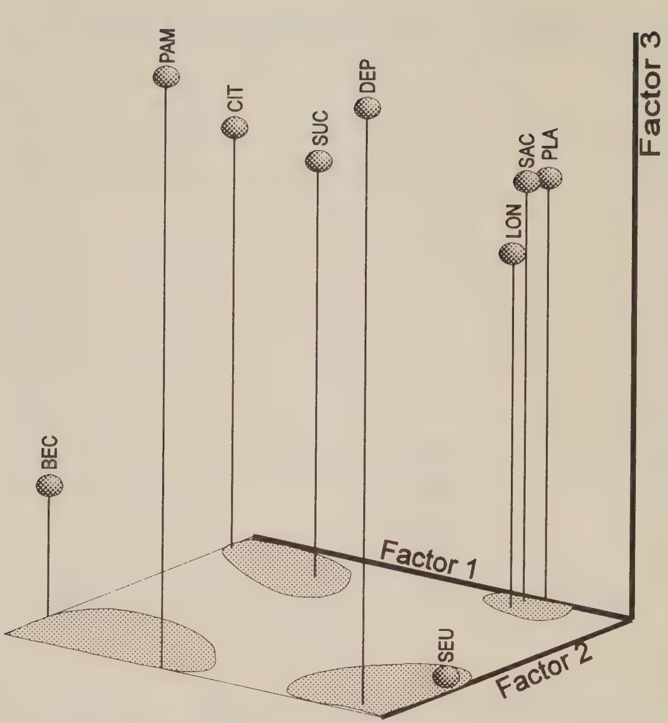


Figure 4. Factor analysis. Graphical display of the first three factors.

Cluster Analysis

The cluster analysis performed with the 25 characteristics of Table II results in a clearly hierarchical arrangement of the nine investigated *Saccobolus* species. Diverse coefficients were used in preliminary assays (data not shown), but best results as tested for association, were obtained with Manhattan metric distances. A few taxonomic studies used this coefficient such as Mueller & Gardes (1991) for *Laccaria*.

Cophenetic correlation [r=0.791] and Mantel test [t=3.763 (p=0.9999)] showed a good fit of the phenogram (Figure 5) when association of matrices were tested.

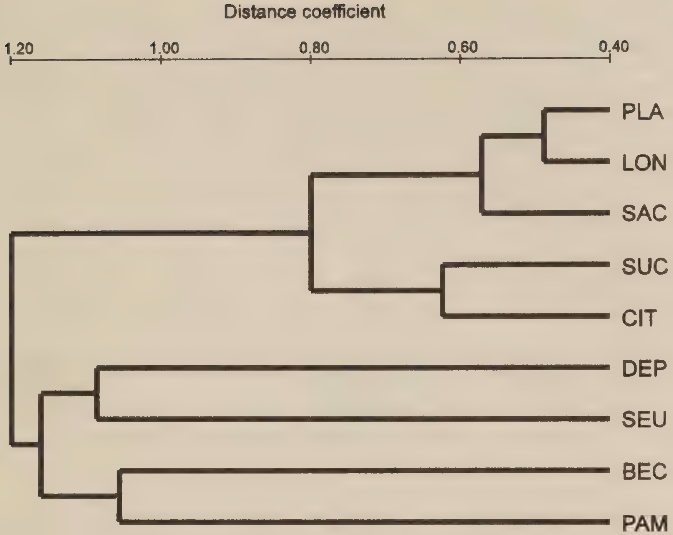


Figure 5. UPGMA Cluster analysis. Phenogram based on distance coefficient.

The phenogram is formed by two clusters, one comprising *S. depauperatus, S. pseudodepauperatus, S. beckii* and *S. pampeanus*, and the other the remaining five species (*S. platensis, S. longevisporus, S. saccoboloides, S. succineus, S. citrinus*).

The results from both techniques (Factor analysis and Cluster analysis) support the classical speciation of *Saccobolus* based on morphology of reproductive structures. Both phenogram (Figure 5) and factors plot (Figure 4) show two clearly separated groups of species. These two subgeneric groups are in fact sections *Saccobolus* and *Eriobolus* as named by Saccardo (1889) and Brummelen (1967).

S. depauperatus, S. pseudodepauperatus, S. pampeanus and *S. beckii*, are species belonging section *Eriobolus*.

Two groups can be distinguished in this section (Figure 1, A1 and A2) by means of components of Factor 1 (see Table III). Factors 3 and 4 (mainly cultural characteristics) provide a good separation between *S. depauperatus* and *S. pseudodepauperatus*, and between *S. pampeanus* and *S. beckii* (Figures 2, 3).

Morphological and cultural characters were used by Gamundí & Ranalli (1969), Ranalli & Gamundí (1975) and Dokmetzian et al. (1986) to separate the four species. This is partially supported in the current study, since characters as apothecial morphology or distribution in culture showed poor contribution to the explained variance as discussed previously.

The other five species are grouped in section *Saccobolus*. *S. saccoboloides*, *S. platensis* and *S. longevisporus* clustered closely together (Figure 1, B1; Figure 5). Morphological differences among these species are subtle at best. However, based on ascopore germination characteristics, the three species could be separated (Figure 3).

Data in the present study support the conclusions of previous reports (Gamundí & Ranalli, 1969; Ranalli, 1974; Ranalli & González Castelain, 1994).

S. citrinus and *S. succineus* are quite distinguishable species on the basis of ascus and ascospore morphology (Figure 1, B2).

This conclusion is consistent with those reported by Brummelen (1967) and Ranalli & Forchiassin (1976) on the basis of morphology or ascoma development and cytology.

Our results indicate that the nine *Saccobolus* species studied are clearly independent taxonomic entities based on morphological and cultural characteristics. However, the number of species included in this study was insufficient to draw conclusions concerning broad species lineages or complexes.

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MYCOTAXON

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GNOMONIA GERANII-MACRORRHIZI SP. NOV. FROM BULGARIA

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ABSTRACT

Gnomonia geranii-macrorrhizi is described as a new species on *Geranium macrorrhizum* from Bulgaria.

The representatives of *Gnomonia* Ces. & de Not. are numerous and widespread in nature. Abundant information has been published about these ascomycetous fungi: Munk (1957), Müller & von Arx (1962), Kobayashi (1970), Barr (1978), Monod (1983) that provides a good basis for various regional investigations.

During routine collections from Vitosha region a species of *Gnomonia* on *Geranium macrorrhizum* L. was obtained. Monod (1983) indicates two species of *Gnomonia* on *Geranium*: *G. geranii* Hollos and *Gnomonia nantensis* Monod.

The species collected by me is easily distinguished from these two species on the bases of the asci, ascospores and host species (Figs. 1-3; Table I). As a result a new species is described.

Gnomonia geranii-macrorrhizi **Fakirova, sp. nov.**
Perithecia immersa, 400-513 µm diametro, globosa depressa, rostra centrale, 250-770 µm longa, 70-84 µm lata. **Asci** fusiformes, continentes 8 spores, 75-92.5 x 14-18.8 µm, cum annello apicali. **Ascosporae** latae ellipsoidae, hyalinae, (21.3-) M=23.98 ± 0.11 (-27.5) x (3.8-) M=5.26 ± 0.64 (-6.3) µm, septo medio, appendiculatae breves et obtusae, 3-3.3 µm longa et 2-2.2 µm lata. Omnis cellula continent 2 guttulas amplas, biseriales.

Holotypus: In foliis et petiolo folii emortui *Geranii macrorrhizi,* Bulgaria, mt. Vitosha, Bistrica, 16.04.1994, V. Fakirova, SOM 21341-M.

Perithecia immersed, scattered, subepidermal, black, 400-513 µm diam., depressed globose, beak central, 250-770 µm long, 70-84 µm wide near base. **Asci** numerous, fusiform, 8-spored, 75-92.5 x 14-18.8 µm, apical annulus conspicuous. **Ascospores** broadly ellipsoid, ends rounded, hyaline, (21.3-) M=23.98 ± 0.11 (-27.5) x (3.8-) M=5.26 ± 0.06 (-6.3) µm, length : width ± 4-5. Septum median, not constricted at the septum, with 2 globules per cell, appendages short and blunt, 3-3.3 µm long, 2-2.5 µm wide, overlapping biseriate in the ascus.*

In overwintered leaves and petioles of *Geranium macrorrhizum* L.

Holotype: *Geranium macrorrhizum* L.,Bulgaria, Mount Vitosha, Bistrica, 16.04.1994, V.Fakirova, SOM 21341-M; DAOM, isotype.

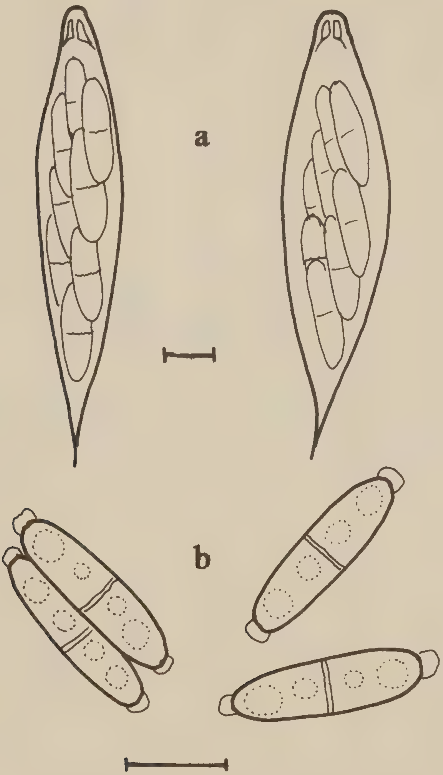

Fig. 1. *Gnomonia geranii-macrorrhizi*: a) asci; b) ascospores. Scale bar 10 µm.

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*Mean and standart error: 100 ascospores. The measurements of ascospores are given in the form: (smallest observed-), mean ± standart deviation, (-largest observed), (Denchev, 1993).

Table I

Comparison of ***G. geranii-macrorrhizi*** and the other species on ***Geranium***

Aspect		**1. *G. g.-macrorrhizi***	**2. *G. geranii***	**3. *G nantensis***
Asci	l	75 - 92.5 x	30 - 40 x	40 - 45 x
(µm)	w	14 - 18.8	6 - 10	8 - 9
Ascospores	l	21.3 - 27.5 x	13 - 18 x	15 - 18.5 x
(µm)	w	3.8 - 6.3	1.8 - 2.5	2.5 - 3
Appendages		blunt	setose	setose
Ascospores contents		2 large globules per cell	coarsely granular	2 small globules per cell
Host		*G. macrorrhizum*	*G. silvaticum* *G. sanguineum*	*G. silvaticum*

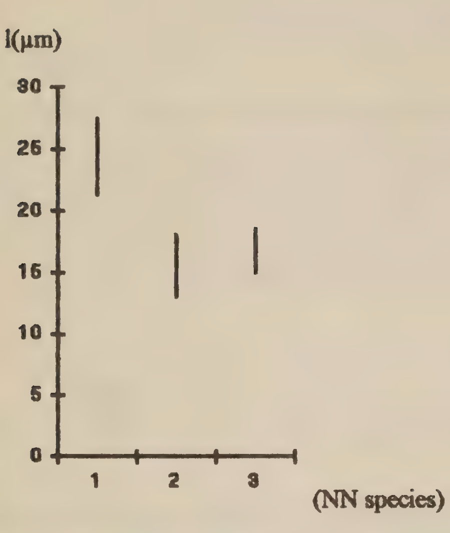

Fig. 2. The length variation of the ascospores:
1. G. g.-macrorrhizi; 2. G. geranii; G. nantensis.

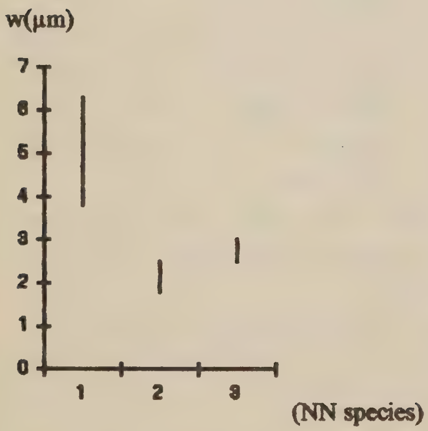

Fig. 3. The width variation of the same ascospores.

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MYCOTAXON

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PHLEBIA SPECIES FROM EASTERN AND SOUTHEASTERN UNITED STATES

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ABSTRACT

Five species of Phlebia (Corticiaceae, Basidiomycotina) with warted or toothed hymenophores and one species with a smooth hymenophore are described and illustrated. Three new species, Phlebia floridensis, P. nantahaliensis, and P. weldeniana, are included, and a new combination, Phlebia fascicularia, is proposed. Phlebia weldeniana is the new name for the invalidly published Odontia brunnescens. Radulum vinosum, an invalid name, is placed in synonymy under P. fascicularia. In addition, Phlebia hydnoidea and P. setulosa are redescribed and illustrated. A cultural description of P. floridensis is included.

INTRODUCTION

In the southeastern United States, the corticioid mycota is poorly known. Recently, several new species of corticioid fungi have been described from this region (Burdsall and Nakasone, 1981, 1983; Burdsall et al., 1981; Gilbertson and Blackwell, 1984, 1985, 1987, 1988; Larsen and Nakasone, 1984; Nakasone, 1983; Nakasone and Micales, 1988). This paper is another contribution to the mycota of the southeastern United States and discusses the species of Phlebia. Three new species are described and one new combination is proposed. Phlebia hydnoidea and P. setulosa are redescribed and illustrated. Although its distribution extends into Canada (Ginns and Lefebvre, 1993), Phlebia setulosa is included because it occurs in southeastern United States and an easily accessible description and illustration are lacking.

Methods employed to study basidiomata and cultures are described in Nakasone (1990b). Color names are from Kornerup and Wanscher (1978), and herbarium abbreviations are from Holmgren et al. (1990). The following names are abbreviated: H. H. Burdsall, Jr., HHB; R. L. Gilbertson, RLG; and J. L. Lowe, JLL.

DESCRIPTION OF SPECIES

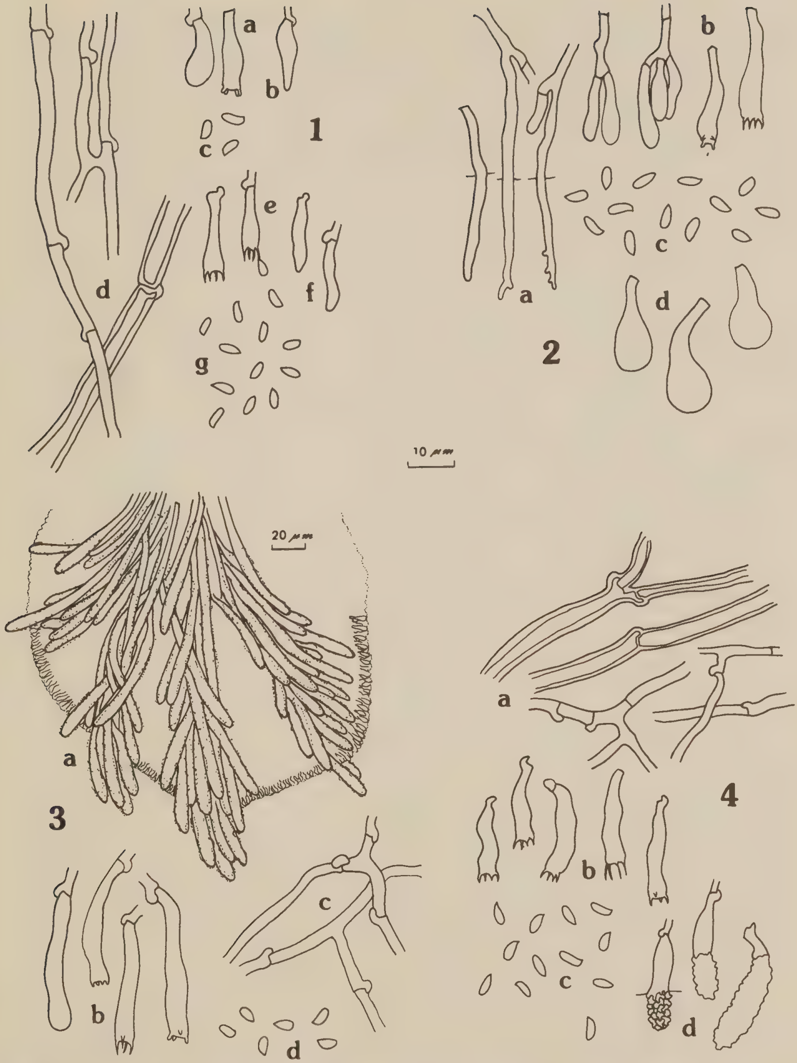
Phlebia fascicularia (Berk. & M. A. Curtis) Nakasone & Burds., comb. nov. **Figs. 1, 5, 6**

≡ Hydnum fascicularia Berk. & M. A. Curtis in Berk., Grevillea 1: 99. 1873. (non Hydnum fasciculare Alb. & Schwein.: Fr., Syst. mycol. I: 418. 1821. ≡ Protodontia fascicularis (Alb. & Schwein.: Fr.) Pilát in Wojewoda, Flora Polska, Grzyby 8: 84. 1977.)

= Radulum vinosum Overh., Bull. Torrey Bot. Club 65: 172. 1938. (invalid name)

(≡ Phlebia vinosa Burds. ined., in Nakasone, Mycol. Mem. 15: 267. 1990.)

Basidiomata annual, resupinate, effuse, orbicular patches coalescing and becoming widely effused, up to 5 cm wide, thin, up to 300 µm thick, adnate, gelatinous when fresh, becoming ceraceous when dried, with or without cracks, typically homogeneous with a single layer that is concolorous with hymenium, sometimes bilayered with an additional layer of white to yellow mycelium closely appressed to substrate; **hymenial surface** continuous, smooth, tuberculate, odontoid or hydnaceous, teeth sparse to very dense, up to 2 mm long, occurring singly or fused at base, conical, apices white to pale yellow, fimbriate to lacerate, in fresh specimens violaceous, greyish red (8C3-4) changing to brownish grey (10E2) at base of teeth, or concolorous with dried specimens, when dry greyish orange (5B3), light brown (6C7-D6), or orange to brownish yellow (5B-C8), sometimes brownish orange (6C6), reddish brown



Figs. 1-4. Microscopic characters from basidiocarps of *Phlebia* species. **Fig. 1.** *P. fascicularia* (Curtis no. 4725, holotype, a-c; FP 102162, d-g). a, mature and immature basidia; b, cystidiole; c, basidiospores; d, subicular hyphae; e, basidia; f, cystidioles; g, basidiospores. **Fig. 2.** *P. floridensis* (HHB 6382, holotype). a, paraphysoid hyphae; b, mature and immature basidia; c, basidiospores; d, cystidia. **Fig. 3.** *P. hydnoidea* (HHB 3107). a, fascicles of branching cystidia; b, mature and immature basidia; c, subicular hyphae; d, basidiospores. **Fig. 4.** *P. nantahaliensis* (HHB 2875, holotype). a, subicular hyphae; b, basidia; c, basidiospores; d, cystidia.

(8E4) to nearly black, younger areas near margins brownish orange (5C3-5) to light brown (6D6), hymenium between teeth and bases of teeth often darker than apices; **margin** indistinct, thinning out, closely appressed, smooth to minutely odontoid, crustaceous, mottled violet grey (18B2), pale yellow (2A3) to greyish brown (9D3) when fresh, but brownish orange (5C5) to light brown (6D6) in dried specimens, occasionally with a deeply fimbriate to fibrillose, white to greyish orange (5B5) edge.

Hyphal system monomitic. **Tooth trama** composed of vertically arranged, agglutinated hyphae (similar to subicular hyphae) that give rise to subhymenium, hyphae in apex often heavily encrusted with small to large, hyaline crystals, typically crystals aggregated at apex. **Subiculum** up to 250 µm thick, a dense textura porrecta of hyphae arranged parallel to substrate, conglutinate; **subicular hyphae** 2.5-4.5 µm diam, nodose septate, rarely branched, with numerous H-connections; walls mostly hyaline but brownish yellow next to substrate, thin to slightly thick, smooth, embedded in a gelatinous matrix; gelatinous materials covering hyphae best observed in margin. **Subhymenium** slightly thickening, 35-55 µm thick, composed of dense, vertically arranged and agglutinated hyphae; **subhymenial hyphae** 2-3 µm diam, nodose septate, short-celled, frequently branched; walls hyaline, thin, smooth, embedded in a gelatinous matrix. **Hymenium** a dense palisade of agglutinated basidia and cystidioles. **Cystidioles** fusoid, 15-17 x 2.5-3.0 µm, clamped at base; walls hyaline, thin, smooth. **Basidia** clavate, 15-17 x 3.5-5.0 µm, clamped at base, 4-sterigmate; walls hyaline, thin, smooth. **Basidiospores** cylndrical to ellipsoid, 3.5-4.5(-5.0) x 1.8-2.2 µm; walls hyaline, thin, smooth, negative in Melzer's reagent.

Habitat: Angiospermous wood and bark, rarely on gymnosperms.

Type of rot: Associated with a white-rot decay.

Distribution: Throughout southeastern United States, as far west as Arkansas and eastern Texas and north to southern Indiana.

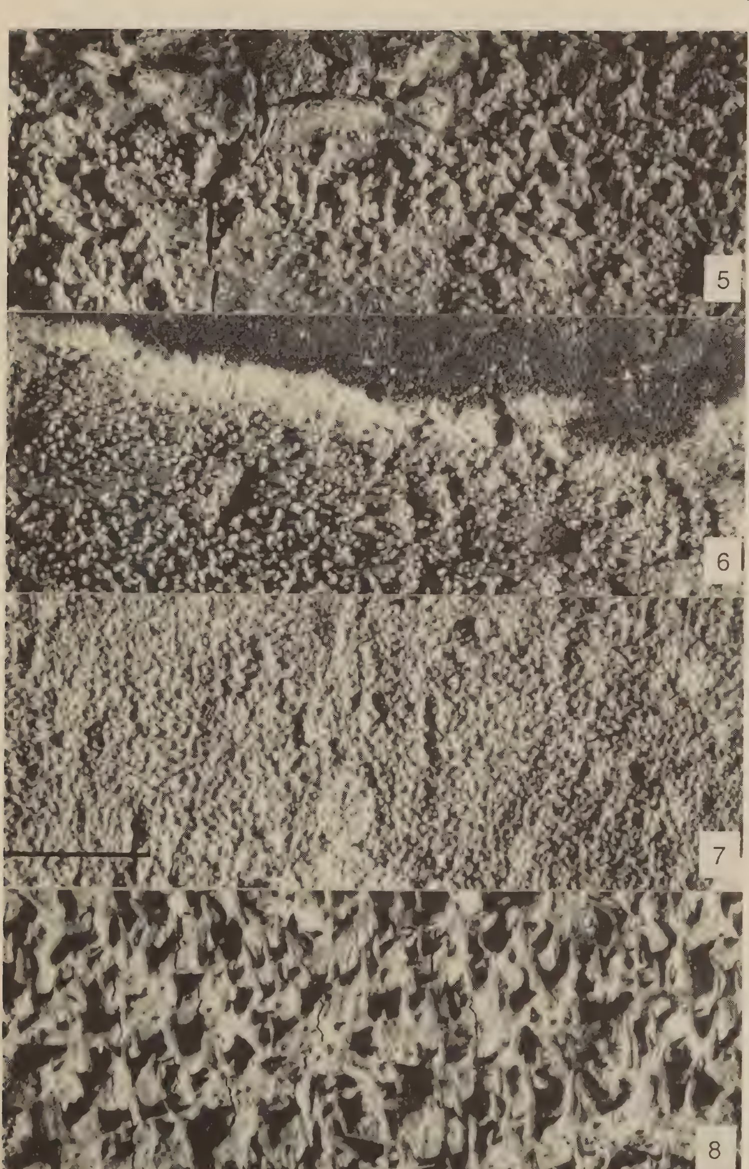
Type specimens examined: UNITED STATES.--**South Carolina**: Society Hill, in Nyssam ut videtur, Mar 1851, Curtis no. 4725 (HOLOTYPE of Hydnum fascicularia: K, Herb. Berk. 1879; ISOTYPE: FH, Curtis Herb.). **Louisiana**: Ferriday, on rotten log (Liquidambar), 1 Aug 1931, L. O. Overholts and F. Kaufert, LOO 15254, ("type" of Radulum vinosum: PACMA #5361; CFMR, FP 55624).

Representative specimens examined: UNITED STATES.--**Alabama**: ad truncos putridos, Peters, Ravenel-Fungi Caroliniani V, no. 20, ut Hydnum membranaceum Bull. (BPI:US0259675). **Arkansas**: Fordyce, on bark of prostrate limb, 6 Sep 1909, C. J. Humphrey, FP 5629 (CFMR). **Florida**: Alachua County, Gainesville, Upper Sugarfoot Prairie, on decorticate log of Liquidambar styraciflua L., 2 Jul 1972, HHB 6511 (CFMR). University of Florida Horticulture Unit, on decorticate Quercus sp., 7 Jul 1972, HHB 6411 (CFMR). Leon County, Tall Timbers Res. Station, Anders Branch, on charred wood of Carya sp., 1 Aug 1977, HHB 9721 (CFMR), and on decayed and decorticate Cornus florida, 23 Jul 1977, HHB 9444 (CFMR). **Georgia**: Bainbridge, Southlands Expt. Forest, on decayed log of Pinus, 20 Mar 1965, J. G. Palmer, FP 70880 (CFMR), and on decayed and decorticate log of Magnolia sp., 14 Apr 1961, R. W. Davidson, W. A. Campbell, and C. H. Driver, FP 90179 (CFMR). Clark County, Athens, Univ. Georgia Botanical Gardens, on L. styraciflua, 19 Aug 1978, RLG 11779, ut Phlebia vinosa (ARIZ:AN017027). **Indiana**: Greencastle, on decorticate logs, Dec 1894, L. M. Underwood, ut Hydnum membranaceum Fr. (BPI:US0259652). **Kentucky**: Hawsville, Wilamette Industries grounds, on decayed log of Populus deltoides Bartram ex Marsh., 22 May 1986, K. K. Nakasone, FP 102162 (CFMR). **Louisiana**: near St. Martinville, on decayed, decorticate Carya sp., 11 May 1890, Langlois 2566, ut Hydnum udum (FH).. St. Tammany Parish, Fontainebleau State Park, on wood of L. stryaciflua, 4 Jul 1983, M. Blackwell 1450, ut Phlebia vinosa (ARIZ:AN017029, CFMR). Caldwell Parish, Copenhagen Prairie, on decayed wood of Ulmus alata Michx., 20 Apr 1984, M. Blackwell 1746 (ARIZ:AN007055, CFMR). **Mississippi**: Harrison County, DeSoto Nat. Forest, Harrison Expt. Forest, Rd H5, Choctaw Creek Basin, on bark of Quercus sp., 5 Apr 1976, HHB 8948 and 8954 (CFMR). Near Vicksburg, Bluffs Expt. Forest, on bark and wood of decayed *L*. *stryaciflua* log, 29 May 1958, R. W. Davidson and E. R. Toole, FP 105024 (CFMR). **North Carolina**: Haywood County, Great Smoky Mts. Nat. Park, above Big Creek Ranger Station, on decayed wood of *L*. *stryaciflua* log, 6 Jul 1970, HHB 4158 and on bark and wood of deciduous log, HHB 4160 (CFMR). Asheville, on hardwood bark, 16 Sep 1959, JLL 11109 (CFMR). **South Carolina**: Huger, Santee Expt. Forest, on wood of *Quercus* sp., 21 Aug 1962, JLL 12549 (CFMR). Pinopolis, on *Carya* sp., H. W. Ravenel 434, ut *H*. *membranaceum*, Fungi Americani Exsic. (BPI:US0259679, ISC:ISU354355). **Texas**: San Jacinto County, Little Thicket Nature Sanctuary, Dillow Wallo Trail, on bark of decayed branches, 3 cm diam, 25 Aug 1967, HHB 85 (CFMR).

Remarks.--The color and form of the teeth of *P*. *fascicularia* are quite distinctive but variable and difficult to describe (Figs. 5-6). Fresh specimens often develop a violet or purple coloration and are distinctly gelatinous. Hyphae and hymenial elements cannot be separated as they are embedded in a clear, gelatinous matrix. Specimens that develop only warts are phenotypically similar to *Phlebia* *livida* (Fr.) Bres. Although the basidia of *P*. *fascicularia* are only half as long as most phlebias, other features, such as the thickening subhymenium, ceraceous texture, and cultural traits, are typical of true phlebias.

After studying and describing the isotype specimen of *Hydnum* *fascicularia*, Gilbertson (1965) placed it in synonymy with *Hydnum* *stenodon* Pers. (= *Mycoacia* *aurea* (Fr.) Erikss. & Ryv.). Although basidiospores of the two taxa are similar in size, those of *H*. *stenodon* are typically curved, in contrast to the straight spores of *H*. *fascicularia*. In addition, the teeth of *H*. *fascicularia* are coarse and unlike the very slender teeth of *H*. *stenodon*.

Examination of type specimens confirms that *Radulum* *vinosum* is conspecific with *H*. *fascicularia*. There is a specimen of *Hydnum* *fasciculare* Berk. & M. A. Curtis in Bresadola's herbarium at BPI (US0259172) that is erroneously labelled co-type and is misidentified. This specimen is *Phanerochaete* *rimosa* (Cooke) Burds.



Figs. 5-8. Hymenial surfaces of *Phlebia* species. **Fig. 5.** *P. fascicularia* (FP 5629). **Fig. 6.** *P. fascicularia* (HHB 9721). **Fig. 7.** P. *floridensis* (HHB 6382, holotype). **Fig. 8.** *P. setulosa* (JLL 15235). Bar equals 20 mm.

For a cultural description, see Nakasone (1990a: 267; as Phlebia vinosa). See Overholts (1938) for a description of R. vinosum and Gilbertson (1965) for a description of the type specimen of H. fascicularia.

Phlebia floridensis Nakasone & Burds., sp. nov.
Figs. 2, 7

Basidiomata arcte appressa substratis, denticulata ad 300 µm longa, abundantia; hyphae efibulatae; cystidia pyriformia vel late clavata, 18-35 x 7.5-11.0 µm, in hymenium et subhymenium inclusa; basidia clavata vel anguste clavata, 16-25 x 4.5-5.0 µm, efibulata basi; basidiosporae cylindricae. Prasens in Floridam et Mississippi. Holotypus: U.S.A., Florida, Alachua County, Gainesville, Rt. 441, post Sears, ad lignam Ostryae virginianae (Mill.) K. Koch, 6 Jul 1972, leg. H. H. Burdsall, Jr. 6832, (CFMR, isotypus: BPI).

Basidiomata resupinate, widely effuse, up to 15 x 8 cm, thin, up to 150 µm thick between the teeth, closely appressed to substrate, ceraceous, with or without cracks, appears to replace entire or upper layers of bark, consisting of one homogeneous layer concolorous with hymenium; **hymenial surface** continuous, typically densely denticulate, 5-8 teeth per mm, occasionally smooth with widely spaced, minute teeth or warts; teeth conical, up to 300 µm long, occurring singly, light orange (5A4-5), greyish orange (5B4-6), brownish orange (5C5-6), or brown (6D6); **margin** often abruptly thinning out with a narrow, farinaceous terminal edge or gradually thinning out, white, with teeth becoming sparse and smaller.

Hyphal system monomitic. **Tooth** trama composed of indistinct hyphae (similar to subicular hyphae) and a central column of large, hyaline crystals bordered by a subhymenial layer, sometimes crystals protruding through apex. **Subiculum** up to 100 µm thick, a dense textura intricata of agglutinated, indistinct hyphae and scattered embedded cystidia that are often covered by yellowish mucilaginous material; **subicular hyphae** 2.5-3.5 µm diam, simple septate, frequently branched; walls hyaline, thin, smooth. **Subhymenium** slightly thickening, 15-30 µm thick, composed of dense, vertically arranged and agglutinated hyphae and scattered embedded cystidia; **subhymenial hyphae** 1.8-3.0 µm diam, simple septate; walls hyaline, thin to slightly thickened, smooth. **Hymenium** a dense palisade of basidia, cystidia, and paraphysoid hyphae. **Paraphysoid hyphae** cylindrical, up to 50 x 2-3 µm, with an obtuse or knobby apex, simple septate at base, protruding up to 25 µm beyond hymenium, scattered or absent; walls hyaline, thin, smooth. **Cystidia** pyriform to broadly clavate, 18-35 x 7.5-11.0 µm, with a short stalk tapering to 2 µm diam, simple septate at base, embedded in hymenium, subhymenium and subicululm, rare to numerous; walls hyaline, thin, often with a thin, fragile, mucilagenous coating. **Basidia** clavate to narrowly clavate, 16-25 x 4-5 µm, simple septate at base, 4-sterigmate; walls hyaline, thin. **Basidiospores** cylindrical, (4.0-)4.5-5.5(-6.0) x 2.0-2.3 µm, hyaline, walls thin, negative in Melzer's reagent.

Habitat: Bark and wood of _Carpinus_, _Ostrya_, _Quercus_, _Magnolia_ and other angiosperms, especially branches.

Type of rot: Associated with a white-rot decay.

Distribution: Florida and Mississippi.

Type specimen examined: UNITED STATES.--**Florida**: Alachua County, Gainesville, Rt 441, behind Sears, on bark and woody slash of _Q. virginiana_, 6 Jul 1972, HHB 6382 (HOLOTYPE: CFMR; ISOTYPE: BPI).

Representative specimens examined (all at CFMR): UNITED STATES.--**Florida**: Alachua County, Buzzard's Roost, on decorticate wood of _Quercus michauxii_ Nutt., 21 Jul 1970, HHB 4466. San Felasco Hammock, on wood of 1-3 cm diam fallen branches of _Carpinus caroliniana_ Walt., 22 Jul 1970, HHB 4669 and 4677; on decorticate woody slash of _Q. laevis_ Walt., 28 Jul 1970, HHB 4786; on bark and wood of _Quercus_ sp. branches, 10 Aug 1985, HHB 11813. Gainesville, N of Newnan Lake, on wood and bark of _Q. nigra_ L. slash, 17 Jul 1970, HHB 4540. Devil's Millhopper, on wood and bark of _C. caroliniana_ branches, 3.5 cm diam, 20 Jul 1970, HHB 4616. University of Florida Horticulture Unit, on decorticate slash of C. caroliniana, 10 Jul 1970, HHB 6466; on wood of Acer sp. slash, 10 Jul 1970, HHB 6460. Dade County, Everglades Nat. Park, Mahogany Hammock, on bark of hardwood, 16 Aug 1972, HHB 7157. Gumbo Limbo Trail, on bark and wood of hardwood slash, 8 Aug 1970, HHB 7006. Leon County, Tall Timbers Res. Station, Fraction Hammock, on bark and wood of Q. nigra slash, 11 Aug 1977, HHB 9905. Woodyard Hammock, on bark and wood of Magnolia sp. slash, 2 Aug 1977, HHB 9515. Marion County, Ocala Nat. Forest, Juniper Spring, on decorticate woody slash of Q. virginiana Mill., 21 Jul 1972, HHB 6737. **Mississippi**: 15 mi NE of Vicksburg, on fallen twigs (1.5 cm diam) of C. caroliniana, 29 Jul 1960, P. L. Lemke, FP 110376.

Culture description.--Growth on 2% malt extract agar rapid, (81-)90+ diam at 1 wk; mats white to pale yellow (4A3) or light yellow (4A4), sometimes with light orange (5A5) or orange (5A6) woolly aggregations, slightly raised to raised, thin, downy-woolly or slightly raised, moderately thick, felty to woolly, sometimes developing raised, cottony-woolly mycelial aggregations especially on sides of plates at 2 wk, by 6 wk mats similar but thicker and woolly areas becoming matted down; margin even, appressed; odor absent or sour at 2 wk, absent at 6 wk; agar bleached at 2 and 6 wk; not fruiting by 6 wk. Oxidase reaction on gallic acid agar positive, growth (trace-)23-47(-66) mm diam at 1 wk, (<10-)20-83(-90) mm diam at 2 wk; on tannic acid agar (TAA) positive, growth 25-47 mm diam at 1 wk, (37-)60-77(-90+) mm diam at 2 wk. TAA mats thin, slightly raised, downy with short aerial hyphal strands at 1 wk, by 2 wk mats similar except thicker with scattered, raised cottony areas and hyphal strands reaching and spreading on plate lids.

Microscopic characters.--Hyphae from margins 3.5-8.0 µm diam, simple septate with rare single clamps, sparingly to moderately branched; walls hyaline, thin. Submerged hyphae (a) 6-8 µm diam, simple septate with rare single clamps and numerous secondary septa, sparingly to moderately branched; walls hyaline, thin to thick, up to 2.5 µm thick; (b) 1.5-6.0 µm diam, simple septate with scattered single clamps, frequently branched; walls hyaline, thin to slightly thick. Aerial hyphae 1.5-6.0(-8.0) µm diam, simple septate with scattered single clamp connections, sparingly branched; walls hyaline, thin to slightly thick, sometimes thick and gelatinized, often coated with pale yellow, resinous globules that disappear in 2% KOH.

Cultures studied: HHB 4669, HHB 4786, HHB 6466, HHB 7157, HHB 9515, HHB 9905.

Remarks.--This species is characterized by very thin, ceraceous basidiomata with tiny teeth and simple septate hyphae. In nature, P. floridensis appears to replace the bark on branches. It is common in Florida, but only one specimen from Mississippi is known.

The cultures have changed on storage on malt agar slants. The most striking change is the loss of hyphae with gelatinized walls. Gelatinized hyphae were orginally quite abundant in 2-wk-old cultures.

Phlebia hydnoidea Schwein., Trans. Amer. Philos. Soc. II, 4: 165. 1832. **Fig. 3**

≡ Odontia hydnoidea (Schwein.) Peck, New York State Bot. Rep. 67: 39. 1903.
≡ Gloeoradulum hydnoideum (Schwein.) Lloyd, The genus Radulum, p. 9., Mycol. Writ. 5. 1917.
≡ Radulum hydnoideum (Schwein.) Lloyd, The genus Radulum, p. 9., Mycol. Writ. 5. 1917.
= Odontia lateritia Berk. & M. A. Curtis in Berk., Grevillea 1: 147. 1873.

Basidiomata annual or perennial(?), resupinate, adnate, broadly effuse, thin to thick, 0.1-5.0(-10.0) mm thick, soft, subceraceous to crustaceous, grandinioid to hydnaceous, in mature areas smooth between teeth but porose to furfuraceous in young areas, cracks numerous and deep, sometimes cracking into cubes, staining red to brown or black in KOH, bilayered with a thin, subceraceous upper layer concolorous with hymenium and teeth and a wider lower layer of dark yelllow or greyish orange (5B5), soft, fibrous to felty mycelium; **hymenial surface** continuous, covering warts and conical teeth, teeth occurring singly or often fused at base, up to

1 mm long, crustaceous to ceraceous, with fimbriate to bristly apices, teeth often darker than smooth areas between protuberances, varied in color from light orange (5A5), orange (5A7), greyish orange (5B5), brownish orange (6C5-7), brown (6B7, 6D7-8), light brown (6D5-6), or yellowish brown (5D4), occasionally darkening to brown (6D7, 7E7), covered with a fine white pubescence from projecting cystidia; **margin** gradually thinning out, up to 2 mm wide, adnate, smooth to felty or furfuraceous, light orange (5A5), sterile.

Hyphal system monomitic. **Tooth trama** a textura porrecta, composed of a core of agglutinated, vertically arranged hyphae (similar to subicular hyphae) and encrusted cystidia enclosed by subhymenium, with fascicles of encrusted cystidia often protruding through apex that sometimes branch off from column at apex. **Subiculum** between teeth up to 360 µm thick, an open textura intricata, somewhat conglutinate, in thick specimens stratified with teeth covered by subhymenium and another tooth layer; **subicular hyphae** 2.5-5.5 µm diam, nodose septate, moderately branched, often collapsed; walls hyaline, thin to slightly thick, smooth or frequently coated with adherent, yellowish brown, mucilaginous materials. **Subhymenium** thickening, up to 110 µm thick, composed of agglutinated, indistinct hyphae and encrusted cystidia arranged in a dense, compact tissue arranged perpendicular to substrate and tooth axis; **subhymenial hyphae** 2-3 µm diam, nodose septate, frequently branched, agglutinated; walls hyaline, thin. **Hymnenium** a dense, compact, conglutinate palisade of basidia and cystidia. **Cystidia** fusiform, cylindrical to slightly clavate, 35-100 x 3.5-9.0 µm, clamped at base, nonstaining, occurring singly or agglutinated in fascicles, enclosed or projecting at tooth apices, arising from tooth trama, subiculum, subhymenium and hymenium; walls hyaline, thin, lightly to heavily encrusted with adherent, brownish yellow crystalline or mucilaginous materials. **Basidia** narrowly clavate, 26-33 x 4-5 µm, 2-3 µm diam at base, with a basal clamp, 4-sterigmate; walls hyaline, thin, smooth. **Basidiospores** ellipsoid to broadly cylindrical, 3.5-5.0 x 2.0-2.5 µm; walls hyaline, thin, smooth, negative in Melzer's reagent.

Habitat: Wood of Castanea dentata (Marsh.) Borkh., occasionally on Quercus sp., and rarely on Pinus sp.

Type of rot: Associated with a white-rot decay.

Distribution: Eastern and southeastern United States.

Type specimens examined: UNITED STATES.--**Alabama**: on Quercus deject., Peters, M. A. Curtis no. 6084 (HOLOTYPE of Odontia lateritia: K). **Pennsylvania**: Bethlehem, on rotten trunk, Schweinitz, Syn. #604 (HOLOTYPE of Phlebia hydnoidea: PH; ISOTYPE: BPI, Michener Coll.).

Representative specimens examined (all on C. dentata unless otherwise noted): UNITED STATES.--**Alabama**: ad truncos putridos, Peters, Ravenel-Fungi Caroliniani V, no. 22, ut Odontia lateritia (BPI:US0265884). **District of Columbia**: Rock Creek, on Quercus sp., 3 May 1903, C. L. Shear 75687 (ISC:ISU 386775). **Georgia**: Rabun County, Chattahoochee Nat. Forest,, Warwoman Dell, 18 Jul 1969, HHB 1993 (ARIZ:AN013060, AN015977, CFMR). **Maryland**: Thurmont, Cunningham Falls State Park, 13 Aug 1966, JLL, FP 100450 (ARIZ:AN013055, CFMR). **Massachusetts**: Toby Mountain Forest, 26 Aug 1963, M. J. Larsen 406 (ARIZ:AN013057, BPI:US0265845, CFMR). **New York**: Essex County, North Elba, on Pinus strobus L., 24 Sep 1902, C. H. Peck, ut O. lateritia (NYS); Phoenix, Sandy Ridge, 16 May 1962, RLG 3136 (ARIZ:AN013058). **North Carolina**: Macon County, Coweeta Expt. Forest, Big Butt, 17 Aug 1969, HHB 3107 (ARIZ:AN015978, CFMR). Nantahala Nat. Forest, along Big Creek, Horse Cove, 6 Aug 1969, HHB 2798 (CFMR), and Ammons Camp, 13 Aug 1969, HHB, 2917 (CFMR). Bernardsville, Dyckman Trail, 17 Sep 1959, JLL and RLG 11144 (ARIZ:AN013059). **Ohio**: Chillocothe, on rotten wood, 7 Aug 1907, W. A. Kellerman, ut O. lateritia (BPI:US0265838). **Virginia**: Giles County, Mountain Lake Biological Station, Twin Spring Trail, 9 Aug 1979, HHB 10759 (CFMR). **West Virginia**: Preston County line, along Rt. 219, on rotten wood, 31 Aug 1946, C. Rogerson, ut O. lateritia (BPI:US0265841). **Wisconsin**: Spider Lake, near Hayward, on rotten, charred hardwood trunk, 30 Sep 1919, C. J. Humphrey 9942, ut *O. lateritia* (BPI:US0265839).

Remarks.--This taxon is easily identified because of the bristly teeth, fascicles of cystidia, and small, broadly ellipsoid spores. The preferred substrate of *P. hydnoidea* is American chestnut, although it is found occasionally on oak and pine. The specimen from Wisconsin is outside the normal range for this species.

Most mycologists assumed that *Odontia lateritia* is a synonym of *Phlebia hydnoidea* (Berkeley, 1873; Peck, 1903; Cooke 1956; Gilbertson, 1965; Ginns, 1970). However, Burdsall (1975) was the first to compare isotype specimens of both species and determined that they are conspecific. We confirm those observations here. Although the type specimen of *O. lateritia* lacks basidiospores, the characteristic fascicles of cystidia of *P. hydnoidea* are present.

Other basidiocarp descriptions are available in Ginns (1970) and Burdsall (1975), in Lloyd (1917), including photograph, as *R. hydnoideum*, and in Gilbertson (1965) as *O. lateritia*. A culture description can be found in Nakasone (1990a: 253).

Phlebia nantahaliensis Nakasone & Burds., *sp. nov.*
Fig. 5

Basidiomata tenuissima, arcte appressa, laevia, ceracea; hyphae fibulatis; cystidia cylindrica, incrusta; basidiosporae allantoideae, 4.5-5.5 x 1.8-2.0 µm. Holotypus: U.S.A., North Carolina, Macon County, Nantahala Nat. Forest, Cliffside Vista Trail, ad lignum cariosum Pini strobi, 12 Aug 1969, leg. H. H. Burdsall, Jr. 2875 (CFMR; isotypus: BPI).

Basidiomata widely effused, closely adnate, thin, up to 150 µm thick, ceraceous, without cracks, consisting of one homogeneous layer concolorous with hymenium; **hymenial surface** continuous, smooth to porose, minutely velutinous from projecting cystidia, translucent, hyaline to yellowish grey (4B2) or greyish yellow (4B3); **margin** thinning out, indistinct, closely attached, ceraceous, smooth, concolorous with hymenium.

Hyphal system monomitic. **Subiculum** up to 130 µm thick, composed of densely compact and agglutinated hyphae, individual hyphae not distinguishable; **subicular hyphae** 2-5 µm diam, nodose septate, agglutinated; walls hyaline, thin to slightly thick. **Subhymenium** absent. **Hymenium** composed of conglutinate basidia and encrusted cystidia. **Cystidia** cylindrical, 20-30 x 4-6 µm, tapering to 2-3 µm diam at base, with a basal clamp, arising from hymenium and protruding up to 25 µm; walls hyaline, thin, lightly to heavily encrusted with hyaline to light yellow crystalline materials. **Basidia** clavate, 17-25 x 4-5 µm, tapering to 2.0-2.5 µm diam at base, with a basal clamp, 4-sterigmate; walls hyaline, thin. **Basidiospores** allantoid, adaxial side straight or slightly concave, 4.5-5.5 x 1.8-2.0 µm; walls hyaline, thin, smooth, negative in Melzer's reagent.

Habitat: Well-decayed and decorticate wood of angiosperms and gymnosperms.

Type of rot: Associated with white-rot decay.

Distribution: Known only from Nantahala Nat. Forest in North Carolina.

Type specimen examined: UNITED STATES.--**North Carolina**: Macon County, Nantahala Nat. Forest, Cliffside Vista Trail, on well-decayed Pinus strobus L., 12 Aug 1969, HHB 2875 (HOLOTYPE of P. natahaliensis: CFMR; ISOTYPE: BPI)).

Specimen examined: UNITED STATES.--**North Carolina**: Macon County, Nantahala Nat. Forest, along Skitty Creek Trail, on well-decayed wood of Quercus sp., 7 Aug 1969, HHB 2817 (CFMR).

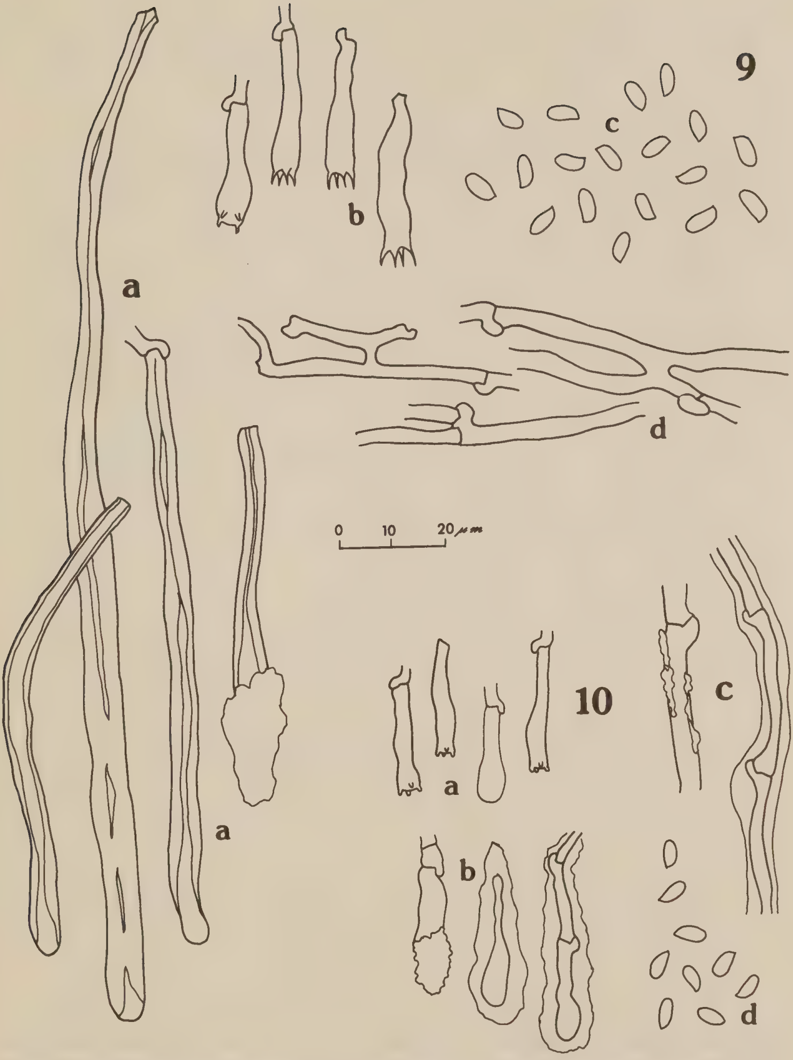
Remarks.--Phlebia nantahaliensis is characterized by very thin, nearly translucent basidiocarps, agglutinated hyphae and hymenial elements, and allantoid basidiospores. The cystidia are fragile and easily destroyed in squash mounts. Because of the ceraceous and very thin nature of the basidiocarp, it is difficult to observe the structure of the subiculum and subhymenium.

Phlebia setulosa (Berk. & M. A. Curtis) Nakasone, Mycol. Mem. 15: 262. 1990. **Figs. 8, 9**

= Hydnum setulosum Berk. & M. A. Curtis in Berk., Grevillea 1: 100. 1873.
= Odontia setulosa (Berk. & M. A. Curtis) Rick, Egatea 18: 127. 1933.
= Steccherinum setulosum (Berk. & M. A. Curtis) L. W. Miller, Mycologia 27: 362. 1935.
= Hyphodontia setulosa (Berk. & M. A. Curtis) Maas G., Persoonia 7: 567. 1974.

Basidiomata annual, resupinate, adnate, up to 15 x 7 cm, moderately thin, up to 0.9 mm thick, ceraceous, hydnaceous but smooth between teeth, teeth velutinous, easily breaking off, sometimes with a few fine irregular cracks, with up to three layers: a thin, subceraceous upper layer concolorous with hymenium and teeth, a middle layer of white, felty mycelium, and a lower layer next to substrate of ceraceous, brown mycelium; **hymenial surface** continuous, covering terete or slightly compressed teeth, teeth up to 10.0 x 0.5 mm, 1-3 teeth per mm, solitary, fused at base, or fused throughout length, gradually tapering to apex, apices entire and acute but in younger teeth obtuse and fimbriate, teeth and hymenial surface between teeth concolorous, sometimes teeth gradually becoming darker, occasionally paler, toward apex, pale yellow (4A3), light yellow (4A4-5), light orange (5A4-5), greyish orange (5B4-5), brownish orange (5C5), to yellowish brown (5D4), occasionally light brown (6D5), with fine white pubescence from projecting cystidia; **margin** up to 5 mm wide, smooth or verrucose, sterile but pubescent from projecting cystidia, gradually thinning out, fimbriate, adnate or slightly detached, smooth, tomentose to pilose, white to yellowish white (4A2) or orange white (5A2), sometimes translucent.

Hyphal system monomitic. **Tooth trama** a textura porrecta, composed of agglutinated, vertically arranged hyphae (similar to subicular hyphae) and encrusted or



Figs. 9-10. Microscopic characters from basidiocarps of *Phlebia weldeniana* and *P. setulosa*. **Fig. 9.** *P. setulosa* (HHB 11749). a, cystidia; b, basidia; c, basidiospores; d, subicular hyphae. **Fig. 10.** *P. weldeniana* (LOO 15252, holotype). a, mature and immature basidia; b, cystidia; c, subicular hyphae; d, basidiospores.

smooth cystidia, at apex hyphae obtuse, smooth or lightly encrusted with tiny, hyaline crystals. **Subiculum** between teeth up to 600 µm thick and often in two distinct layers: (a) next to substrate a dense textura porrecta with hyphae oriented parallel to substrate, 200-400 µm thick, conglutinate; (b) upper subiculum an open textura intricata of conglutinate hyphae and scattered encrusted cystidia, 100-200 µm thick; **subicular hyphae** 2.5-4.0 µm diam, nodose septate, sparingly to moderately branched, often with H-connections, tightly agglutinated; walls hyaline, thin to thick, up to 2 µm thick. **Subhymenium** thickening, 50-200 µm thick, composed of indistinct, agglutinated hyphae and encrusted cystidia arranged in a dense, compact tissue arranged perpendicular to substrate and tooth axis; **subhymenial hyphae** 1.5-3.0 µm diam, nodose septate, short-celled, frequently branched, somewhat agglutinated; walls hyaline, thin, smooth. **Hymenium** a dense, compact, conglutinate palisade of basidia and cystidia. **Cystidia** cylindrical to clavate, 40-270 x 5.5-10.0(-11.0) µm, clamped at base, nonstaining, enclosed or projecting up to 45 µm, arising from tooth trama, subhymenium and hymenium; walls hyaline, 1-5 µm thick, sometimes thinning toward apex, smooth or lightly to heavily encrusted with fine to coarse, hyaline crystals, embedded cystidia often encrusted but if protuding then encrusted at apex only. **Basidia** clavate, 22-40 x 5.0-6.5 µm, tapering to 2.5-4.0 µm diam at base, with a basal clamp, 4-sterigmate; walls hyaline, thin, smooth. **Basidiospores** ellipsoid to broadly cylindrical, 5.0-6.5(-7.0) x 3.0-3.5 µm; walls hyaline, slightly thickened, smooth, negative in Melzer's reagent.

Habitat: Typically well-decayed, decorticated wood of angiosperms, occasionally on bark.

Type of rot: Associated with a white-rot decay.

Distribution: Widely scattered in eastern United States, also reported from Manitoba, Nova Scotia, and Northwest Territories in Canada (Ginns and Lefebvre, 1993).

Type specimen examined: UNITED STATES.--**Alabama**: no location, on Liquidambar, Peters, Curtis no. 6086 (HOLOTYPE of Hydnum setulosum: K; ISOTYPES: FH, NY-J. H. Banker Coll. and Underwood Coll.).

Representative specimens examined: UNITED STATES.--**Florida**: Alachua County, Rt 441, behind Sears, on Quercus sp., 6 Jul 1972, HHB 6400 (CFMR). Upper Sugarfoot Prairie, on bark of living Quercus nigra, 17 Jul 1972, HHB 6599 (CFMR). Marion County, Okalawaha River, on Acer rubrum L., 3 Aug 1972, HHB 6946 (CFMR). **Illinois**: Johnson County, Lower Cache River, on bark and wood of Quercus sp., 9 Sep 1983, HHB 11749 (CFMR). Havana, on old decorticate log, 1897, H. C. Beardslee 15 (FH). **Iowa**: Iowa City, on Acer sp., 22 Aug 1934, G. W. Martin 1547 (ISC:ISU 387065). Wellman, on old Fomes sp., 17 Oct 1931, L. W. Miller (ISC:ISU 387052). **Mississippi**: McCool, on Nyssa sp., 18 Oct 1955, P. L. Lentz 476, FP 106976 (CFMR). Huntington Point, on Liquidambar sp., 4 Oct 1955, P. L. Lentz, FP 106520 (CFMR). **New York**: Cazenovia, on decorticate hardwood log, 26 Jul 1948, F. J. Czabator 2212 (FH). Jamesville, Clark Reservation, on decorticated Acer saccharinum Marsh., 30 Aug 1959, JLL and RLG 10793 (BPI:US0261091, DAOM, FH, NY); on hardwood, 29 Sep 1972, JLL 15235 and 15238 (CFMR). **Pennsylvania**: Trexlertown, on decorticate coniferous wood (?), 1899, Dr. Herbst (FH).

Remarks.--Phlebia setulosa is easily recognized because of the pubescent teeth, encrusted cystidia, and relatively large spores. Although locally abundant, it is not common. The cystidia of the tooth axis may resemble skeletal hyphae, thus P. setulosa was placed in the genus Steccherinum and later in Hyphodontia. However, cultural and molecular evidence suggest that the correct placement of this species is in Phlebia (Nakasone, 1990a, 1991).

For a description of the type specimen, see Maas Geesteranus (1974) and Gilbertson (1965). Additional descriptions of basidiomata are available in Miller (1935) and Miller and Boyle (1943). Cultures are described by Lombard and Chamuris (1990), Nakasone (1990a), and Wang (1965).

Phlebia weldeniana Nakasone & Burds., sp. nov.

Fig. 10

= Odontia brunnescens Overh., Bull. Torrey Bot. Club 65: 171. 1938. (invalid name)

Basidiomata laevia vel verruculosa, hyphis fibulatis, basidiis anguste clavatis, cystidiis clavatis vel fusiformibus, incrustatis et inclusis, basidiosporis ellipsoideis, (4.5-)5.0-6.0(-6.5) x 2.2-2.5(-3.0) µm. Holotypus: U.S.A., Louisiana, Oak Grove, ad emortuus ramus Liquidambaris, 7 Aug 1931, leg. L. O. Overholts et F. Kaufert, LOO 15252 (PACMA: 5498; isotypus: CFMR).

Etymology: named for Arthur L. Welden in recognition of his contribution to the systematics of wood decay basidiomycetes.

Basidiomata annual, resupinate, effuse, up to 50 x 30 mm, moderately thin, up to 250 µm thick, closely appressed, ceraceous, with scattered cracks, distinctly bilayered with a narrow upper layer concolorous with hymenium and a wider, white lower layer; **hymenial surface** continuous, smooth to verruculose, occasionally rugulose, warts smooth, up to 200 x 300 µm, in mature areas up to 3-4 small warts per mm, greyish orange (5B4-6), brownish orange (6C5-8), light brown (6D5) to brown (6D7-8, 6E5); **margin** abrupt or thinning out, even to slightly bayed, fimbriate, tightly appressed, smooth, concolorous or paler than hymenium, sometimes with a very narrow, white, fibrillose edge.

Hyphal system monomitic. **Subiculum** up to 200 µm thick, hyphae next to substrate forming a narrow horizontal layer, up to 30 µm thick, then becoming vertical, agglutinated, with yellow, resinous matter throughout, sometimes with coarse hyaline crystals and embedded cystidia; **subicular hyphae** 3.5-5.0 µm diam, up to 9.0 µm diam including encrustations, nodose septate, sparsely to moderately branched; walls hyaline, thin, smooth or lightly to heavily encrusted with hyaline, refractive crystals. **Subhymenium** thickening, 20-40 µm thick, hyphae oriented perpendicular to substrate, dense and tightly agglutinated, often appearing degraded and indistinct, with scattered embedded cystidia; **subhymenial hyphae** 2-3 µm diam, nodose septate, short-celled, frequently branched; walls hyaline, thin, usually coated with particulate, yellow, resinous substances. **Hymenium** a dense, agglutinated palisade of basidia and cystidia. **Cystidia** clavate to fusoid, 24-45 x 5-7 µm, up to 36 µm diam including encrustations, clamped at base, scattered, embedded in subiculum and subhymenium, occasionally in hymenium; walls hyaline, thin, typically heavily encrusted with refractive, hyaline crystalline matter. **Basidia** narrowly clavate, (14-)21-24 x 3.5-5.5 µm, tapering to 2-3 µm diam at base, with basal clamp, 4-sterigmate; walls hyaline, thin. **Basidiospores** ellipsoid, (4.5-)5.0-6.0(-6.5) x 2.2-2.5(-3.0) µm; walls hyaline, thin, smooth, negative in Melzer's reagent.

Habitat: Bark and wood of angiosperms.

Type of rot: Associated with a white-rot decay.

Distribution: Known only from Louisiana, the type location.

Type specimen examined: UNITED STATES.--**Louisiana**, Oak Grove, on dead (corticate) branch of Liquidambar, 7 Aug 1931, L. O. Overholts and F. Kaufert, LOO 15252 (HOLOTYPE of P. weldeniana and "type" of Odontia brunnescens: PACMA; ISOTYPE: CFMR).

Specimens examined: UNITED STATES.--**Louisiana**: St. Martinsville, on decaying pieces (bark), 11 Mar 1890, A. B. Langlois, Flora Ludoviciana, no. 2610, ut Grandinia tuberculata Berk. & M. A. Curtis (FH); no location given, (on bark and wood), 23 Aug 1889, A. B. Langlois, ut G. tuberculata (BPI:US0264879).

Remarks.--Phlebia weldeniana is a rare species that is known only from Louisiana. It was first described by Overholts (1938) as Odontia brunnescens; because a Latin description was lacking, the name is invalid. The even, small warts and heavily encrusted, embedded cystidia are diagnostic for this taxon. However, the cystidia are fragile and easily destroyed in squash mounts. At times, the embedded encrusted cystidia appeared to be merely slightly differentiated terminal hyphal tips. The illustration in Overholts (1938) demonstrates how the encrusted cystidia are distributed throughout the basidioma. The same publication also includes a photograph of the type specimen of *O. brunnescens*. Gilbertson (1963) also examined the type specimen and included observations on hyphal characters. We did not observe obclavate hymenial cystidia described by Overholts (1938).

DISCUSSION

Phlebia is poorly defined and delimited (Eriksson, et al., 1981), and the limits of the genus are still being explored. Species of *Phlebia* are characterized by ceraceous texture, thickening subhymenium, clamp connections, narrowly clavate basidia, and hyaline spores and are associated with white-rot decay. In pure culture, phlebias grow rapidly and develop broad, simple-septate hyphae in the margin from which nodose sepate branches arise and proliferate (Boidin, 1964; Nobles, 1958; Stalpers 1978). Some species described herein challenge this traditional concept of the genus. For example, *P. floridensis* lacks clamp connections in the basidiocarp. All species of *Phlebia*, except for *P. deflectens* (Karst.) Ryv., are regularly nodose septate. Culturally, however, *P. floridensis* displays typical *Phlebia* features, except that regularly clamped hyphae are lacking. *Phlebia nanthaliensis* is very thin and lacks a distinct, thickening subhymenium that is characteristic of phlebias. Similarly, the generic placement of *P. hydnoidea* has been questioned. Gilbertson (1971) suggested that this taxon could be placed in *Steccherinum*, but Ginns (1970) saw some resemblence to *Veluticeps*. However, preliminary sequence data from the internal transcribed spacer region of the ribosomal DNA repeat suggest that *P. hydnoidea*, *P. floridensis*, *P. nanthaliensis*, and *P. setulosa* belong to *Phlebia sensu stricto* (Nakasone, 1991).

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THE GENUS PHELLINUS (HYMENOCHAETACEAE) ON THE ISLAND OF SANTA CATARINA, BRAZIL.

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ABSTRACT

Eleven species are described and illustrated from Santa Catarina Island. A key for the identification of unnamed specimens is included.

KEY WORDS

Phellinus, Hymenochaetaceae, taxonomy.

INTRODUCTION

The species of the genus **Phellinus** Quélet actively degrade lignin and cellulose, causing a white-rot of wood, both in living trees and woody debris. It is a large genus distributed principally in tropical regions (Larsen & Coobb-Poulle, 1990; Ryvarden & Johansen, 1980).

The fundamental characteristics that distinguish the genus within the family Hymenochaetaceae are the dimitic hyphal system (Cunningham, (1947) and the rigid basidiome (Ryvarden, 1991). **Phellinus** is very similar to **Inonutus** Karsten, and at times they are difficult to separate.

Spore colour, a distinctive feature originally used by Bourdot & Galzin, was completely abandoned by Fiasson & Niemela (1984) who emphasize that the only differential character between **Phellinus** and the other genera is dimiticy.

In the Island of Santa Catarina, there was no record of species of this genus for about hundred years (Loguercio-Leite, 1990) until Loguercio-Leite & Wright, 1991) listed eleven species for the first time they provided neither descriptions nor a key.

MATERIAL AND METHODS

The specimens studied were collected on the Island of Santa Catarina, twice per year (summer and winter), during a period from January 1987 to January 1989. Beside these collections other specimens deposited in the Herbaria FLOR (Universidade Federal de Santa Catarina, Brasil) and BAFC (Universidad de Buenos Aires, Argentina) were studied. Herbaria abbreviations follow Holmgren & Keuken (1974).

For the taxonomic study mecro-and microscopical features were analysed, including general aspect, pore size in mm, and basidiome color. Colors are those of Munsell (1975). Microscopic preparations were mounted in 5% KOH, 1% aqueous solution of phloxine, Melzer's reagent (Singer, 1949) and lactophenol cotton-blue (Kotlaba & Pouzar, 1964). Structures observed were illustrated using a camera lucida.

RESULTS

The results obtained are presented in a key to the species, and in the description of the eleven species.

Key to the species

1. Basidiomata resupinate......................2
 2. Hymenial setae absent.....................3
  3. Basidiospores dextrinoid.......**P. punctatus**
  3' Basidiospores IKI............**P. umbrinellus**
 2' Hymenial setae present.....................4
   4. Setae scant; spores ellipsoid to subglobose..............................**P. cesatii**
   4' Setae abundant; spores subcylindric to cylindric.................................5
    5. Setae ventricose; spores subcylindric with pointed apex..............**P. punctatiformis**
    5' Setae subulate; spores cylindric.................................**P. ferreus**

1' Basidiomata pileate (effuse-reflexed, dimidiate to ungulate)..............................6
- 6. Hymenial setae absent; spores dextrinoid. ....**P. apiahynus**
- 6' Hymenial setae present; spores IKI-.....7
  - 7. Setae subulate..................**P. gilvus**
  - 7' Setae ventricose to subventricose......8
    - 8. Setae subventricose, spores broadly ellipsoid..................**P. undulatus**

8' Setae ventricose..........................9
- 9. Apex mainly uncinate...... **P. whalbergii**
- 9' Apex only straight.........................10
  - 10. Basidiospores subglobose to troadly ellipsoid with slightly thickened wall. ....**P. flavomarginatus**
  - 10' Basidiospores narrowly ellipsoid to subcylindric with thin wall....**P. callimorphus**

Descripiton of the species

Phellinus apiahynus (Speg.) Rajch. & Wright, Mycologia 79: 251, 1987.
Fomes apiahynus Speg., Bol. Acad. Cienc. Córdoba, 11: 438, 1889.

Fig. 1

Basidiomata perennial, sessile, ungulate, triquetrous to applanate, 15 - 55 x 40 mm, 0.9 - 2.2 mm thick. Pileus surface concentrically zonate, smooth, sometimes longitudinally cracked, yellowish brown (5/2, 5,6 10YR), dark brown (3/2 7.5YR) to grayish brown (5,2 10 YR). Margin acute, thin, lighter than the pileus surface, yellowish brown (5/8 10YR) to olive yellow (6/8 2,5Y). Pores circular to angular, 5-8 per mm, dissepiments entire, thin; tubes yellowish brown (5/8 10YR), pluristratified. 2-6 layered separated by layers of context, concolourous with the tubes, thin, 1 mm thick, with a black line under the pileus surface.

Hyphal system dimitic, generative hyphae with thin to slightly thickened walls, 1.80 - 2.88 µm diam., predominating: skeletal hyphae thick-walled to subsolid. brown in KOH, straight to sinuous, 2.88 - 5.40 µm diam. Setae absent. Basidia clavate 11.52 - 12.60 x 7.56 - 8.28 µm. Basidiospores globose to Subglobose, hyaline, smooth, thick-walled, 5.04 - 6.12 x 4.32 - 5.40 µm, dextrinoid.

Distribution: Neotropical, Argentina (Misiones), Brazil (Paraná, Santa Catarina, São Paulo). Type locality: Apiahy, São Paulo, Brazil.

Material examined: BRAZIL, Santa Catarina, Ilha de Santa Catarina, Morro Lagoa da Conceição, Loguercio-Leite & Furlani 35, 7/VIII/87 (FLOR 10503); ibid, ipse 220, 26/VII/88 (FLOR 10616); ibid, Paraná, Ponta Grossa, P.E. Villa Velha, Meijer 1225, 30/IV/89 (BAFC 32979); ARGENTINA, P.N. Iguazú, Wright, Deschamps & Del Busto M2405, 27/X/73 (BAFC 24382).

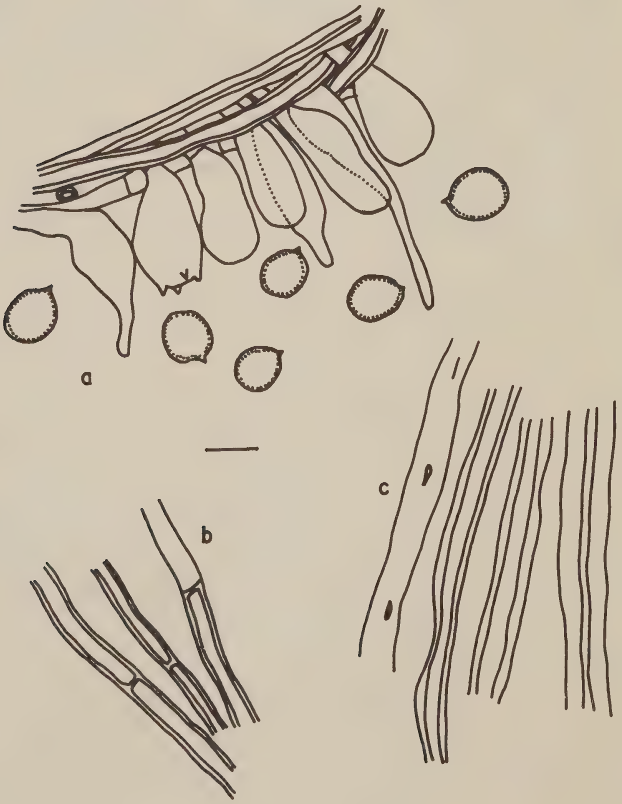

Fig. 1. **Phellinus apiahynus.** (a) hymenium and spores; b) generative hyphae; (c) skeletal hyphae. Scale bar = 5 µm.

Remarks: The subglobose to globose and dextrinoid spores indicate a relationship to **Phellinus robustus** (Karst.) Bond. & Sing., differing, however, by its small triquetrous, elegant, basidiomes and smaller spores (Rajchenberg & Wright, 1987). Spore-wall has been described as "thin" by Wright & Blumenfeld (1986, as **Ph. elegans**). More exhaustive observations of the above specimens indicate that the spore-wall is slightly thickened. It was first recorded for Santa Catarina State by Loguercio-Leite & Wright (1991).

Phellinus callimorphus (Lév.) Ryv., Prel. Polyp. Flora of East Africa, p. 145. 1980.

Polyporus callimorphus Lév., Ann. Sci. Nat. Bot. 5: 133, 1846.

Fig. 2.

Basidiomata perennial, pileate, applanate, dimidiate to conchate, broadly attached, semicircular to elongated. 2 - 115 x 1 - 85 - 2 - 8 mm thick. Pileus surface finely velutinate to glabrous, concentrically sulcate with narrow bands, sometimes slightly radially striate; reddish brown (4/4 5YR), strong brown (5/8 7.5YR), yellow (7/8 10YR), brownish yellow (6/8 10YR) to reddish yellow (6/8, 7/8 7.5YR). Woody hard in thick specimens, tough to coriaceous in thin ones. Margin acute, lobed or entire, concolorous. Pore surface brown (4/2, 4/4, 5/4 7.5YR), strong brown (5/6, 5/8 7.5YR) to yellowish brown (5/8 10YR); pores circular, (6-)7-10 per mm, dissepiments entire, thick; tubes unistratified, .5 - 1 mm long. concolorous; context strong brown (5/8 7.5 YR) to brownish yellow (6/8 7.5YR), 7 mm thick at the base of basidiome.

Hyphal system dimitic, generative hyphae with thin to slightly thickened walls, (1.44-) 1.80 - 2.88 µm diam., skeletal hyphae yellow to brownish, thick-walled, (2.52-) 2.88 - 3.96 µm diam.. Setae ventricose, thick-walled, apex acuminate, brown, 23.40 - 32.40(-36.0) x (4.32-)4.68 - 5.40 µm. Basidia clavate, hyaline, thin-walled. 9.00 - 12.60 x 3,96 - 4.32 µm. Basidiospores ellipsoid to subcylindrical, thin-walled, hyaline. (3.24-)3.60 - 3.96(-4.32) x 2.16 µm, IKI-.

Distribution: pantropical, Madagascar. Jamaica. Brazil (Santa Catarina), Rwanda. Type locality: Madagascar.

Ph. callimorphus

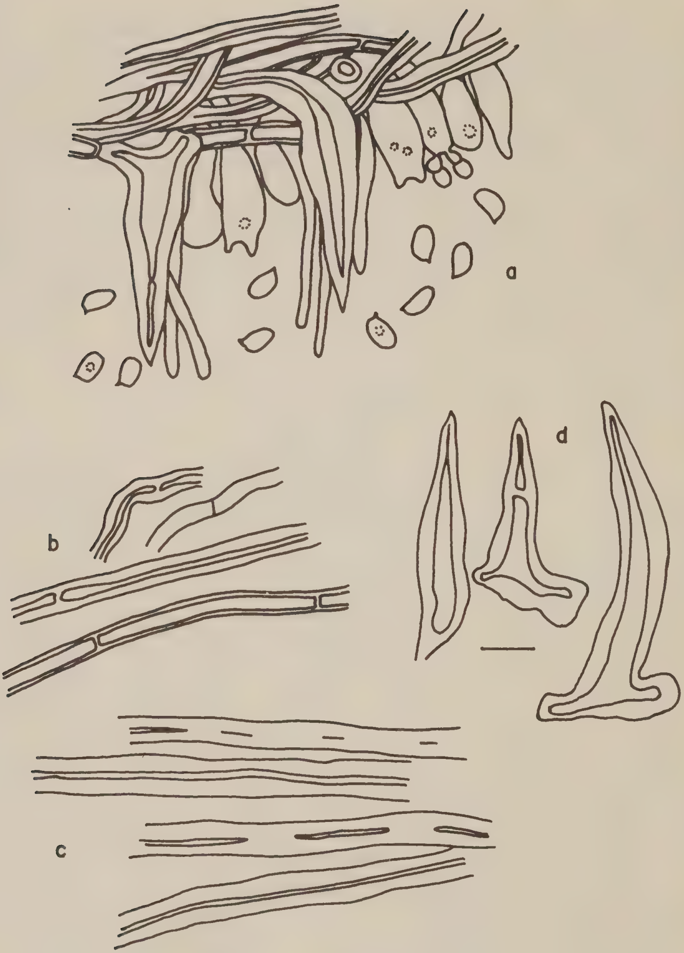

Fig. 2. **Phellinus callimorphus.** (a) hymenium and spores; (b) generative hyphae; (c) skeletal hyphae; (d)setae. Scale bar = 5 µm.

Material examined: BRAZIL, Santa. Catarina Státe, Ilha de Santa Catarina, Campus Universitário, Loguercio-Leite & Furlani, 90,28/I/88 (FLOR 10551); ibid, Morro da Lagoa da Conceição, ipse 232, 26/VII/88 (FLOR 10620); ibde, ipse 278, 4/VIII/88 (FLOR 10644); JAMAICA. Windsor State. Powell 168 F1785. 23/VIII/55, ex K.

Remarks: Ryvarden & Johansen (1980) included **Phellinus roseocinereus** (Murr.) Reid as a synonvm of **P. callimorphus**. A study of the matersals of the former species from Mexico and Guadaloupe showed great similarity with the Jamaican specimens of **P. callimorphys**, as well as with ours. Larsen & Lombard (1988), however, keep the names autonomous. It was recorded for the first time for Brazil by Loguercio-Leite & Wright (1991).

Phellinus cesatii (Bres.) Ryv., Norw. J. Bot. 19: 234, 1972.

Poria cesatii Bres. Studi Trent. (ser. II)7:57, 1926.

Fig. 3.

Basidiomata perennial, resupinate flat to concave, wood hard, 55 x 45 mm in bistratified basidiomes, friable, yellow to yellowish brown (7/8, 5/6 10YR); margin narrow, concolor, Pore surface dark yellowish brown (4/4 10YR), pores circular to angular in the margin, 6 - 7(-9) per mm, dissepiments entire, thick; uni - to bistratified, 3 - 6 mm deep, concolorous, context very thin, .5 mm deep, fibrous; between the context and the substrate a black line may be observed.

Hyphal system dimitic, generative hyphae hyaline to pale yellow, with thin to thickened walls, 2.16 - 3.96 µm diam.; skeletal hyphae brownish, straight to slightly sinuous, thick-walled, 2.52 - 3.96 µm diam.. Setae scant, ventricose to subulate, yellowish, 18,0-21.6 x 3.60 - 4.32 µm. Basidia clavate, hyaline, thin-walled, 9.00-9.72 x 4.32 - 5.04 µm. Basidiospores broadly ellipsoid to subglobose, with a slightly thickened yellow wall, 3.60 - 4.32 x 2.52 - 2.88 (-3.42) µm, IKI-.

Distribution: Sarawak, Sri Lanka, Brasil (Santa Catarina). Type locality: Sarawak.

Material examined: BRAZIL, Santa Catarina, Ilha de Santa Catarina, Morro Lagoa da Conceição, Loguercio-Leite & Furlani 59, 13/I/88 (FLOR 10521), SRI LANKA, Peradeniya, Petch., VII/1909, cotype,

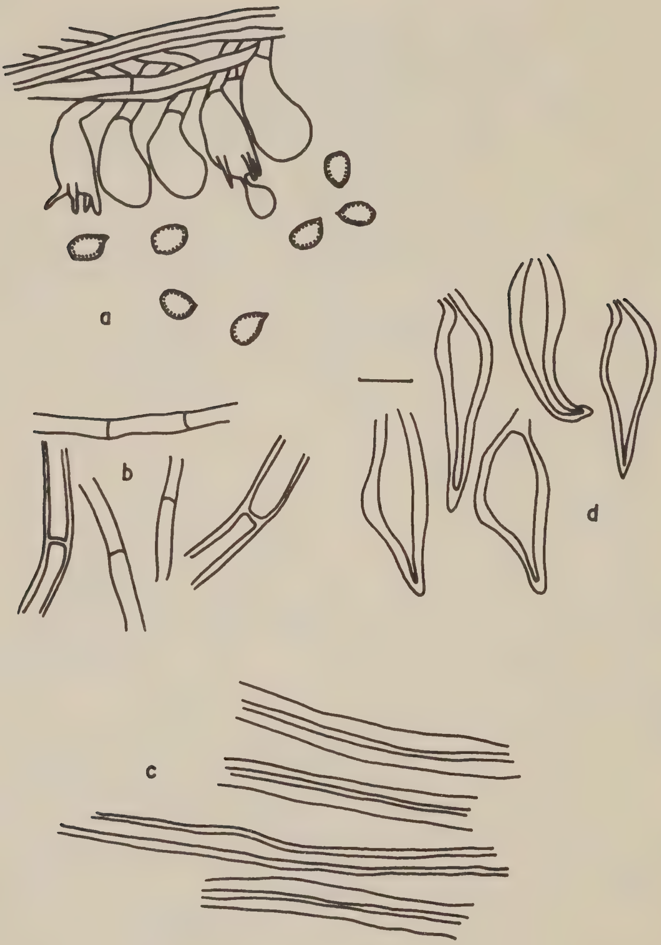

Fig. 3. **Phellinus cesatii.** (a) hymenium and spores; (b) generative hyphae; (c) skeletal hyphae; (d) setae. Scale bar = 5 µm.

K2884 (BAFC 29015).

Remarks: Lowe (1963) states that **Poria cesatii** Bres. lacks setae and separated **Poria gilvoides** Petch as autonomous species. Lowe (1966) comments under **Poria cesatii** Bres. that it "has a hirny black line near the substratum", and he implies that **Poria gilvoides** Petch has pale spores and lacks setae. Ryvarden & Johansen (1980) did not record setae in their description of **Phellinus gilvoides**, nor did they record the presence of a dark line contiguous to the substrate. upon examining the cotype specimen of **Phellinus gilvoides** (K) we agree, regarding this feature and the lack of setae, with David and Rajchenberg (1985), who studied the same material of **P. gilvoides**. considering it an undeveloped specimen. Larsen & Coob-Poulle (1990) agreed with this. These authors considered **P. cesatii** the correct name for **P. gilvoides** (Petch) Ryv., since the latter is a later homonym of **P. gilvoides** (Lloyd) Imaz. The species was first recorded for Brazil as **P. gilvoides** (Petch) Ryv. by Loguercio-Leite & Wright (1991).

Phellinus ferreus (Pers.) Bourd. & Galz.. Hymen. France, p. 627, 1928.

Phellinus ferreus Pers., Mycol. Europ., 2: 898, 1823.

Fig. 4.

Basidiomata perennial, resupinate to effuse reflexed, 200 mm long, 1.5 mm thick, woody, difficult to separate from the sustrate. Pale brown to yellowish brown (6/3, 5/4, 5/6 10YR); margin sterile, yellow (8/8 10YR), 1.0 mm wide; pores circular, 5 - 7 per mm, dissepiments thick, entire. Tubes yellow (7/8 10YR), indistinctly stratified, 1.0 mm deep, concolorous; context concolorous with tubes, thin, corky, 5 mm deep.

Hyphal system dimitic, generative hyphae with thin to slightly thickened walls, (1.44-) 1.80 - 2.52 µm diam.; skeletal hyphae thick-walled, yellowish brown, 2.16 - 3.60 µm diam. Setae subulate to slightly ventricose, thickened and brown walls in KOH, 21.60 - 32.24 x 3.60 - 6.12 µm. Basidia clavate, hyaline, 9.00 - 11.52 x 2.52 - 3.96 µm. Basidiospores cylindrical, hyaline, thin-walled, smooth, 4.68 - 6.12 x 1.80 - 2.52 µm, IKI-.

Distribution: Cosmopolitan. Type locality: Europe.

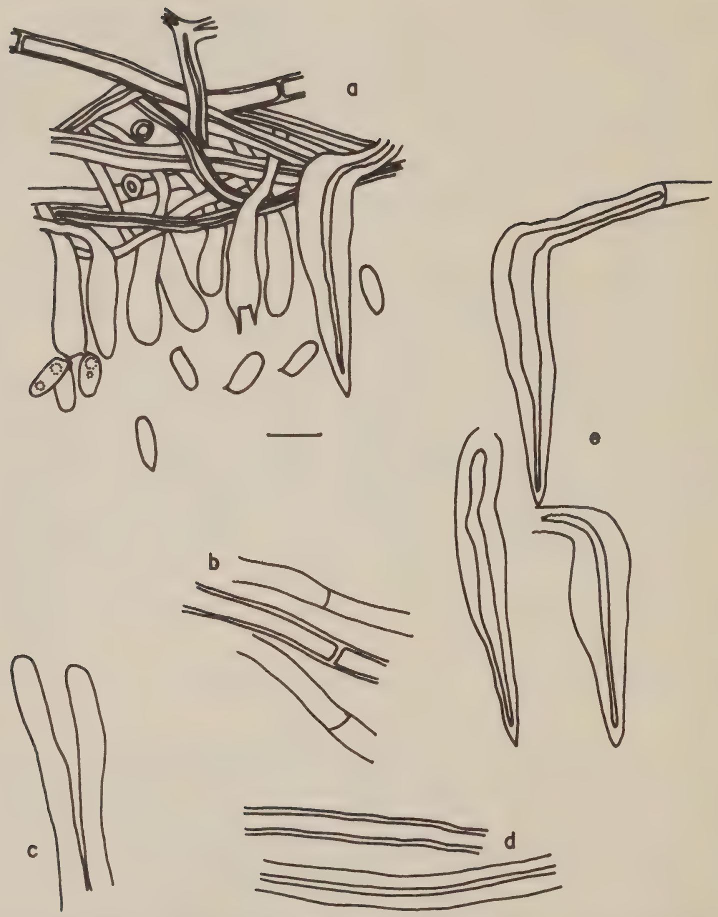

Fig. 4. **Phellinus ferreus.** (a) Hymenium and spores; (b) generative hyphae; (c) detail of the dissepiment trama; (d) skeletal hyphae; (e) setae. Scale bar = 5 µm.

Material examined: BRAZIL, Santa Catarina, Ilha de Santa Catarina, Costa da Lagoa, Loguercio-Leite & Zanin, 25/V/85 (FLOR 10133); ibid, Morro Lagoa da Conceição, Loguercio-Leite & Furlani 270, 4/VIII/88 (FLOR 10642); RWANDA, For. Rugege, Lambinon 74/1063, dupl. Herb.. Univ. Leod. (BAFC s/n); KENYA, Kakamega, Nannfeldt 22265, 9/III/72 (BAFC s/n).

Remarks: This species is similar to **P. ferruginosus** (Schr.: Fr.) Pat., differing by having larger subulate setae and longer basidiospores. It was recorded for the first time for the Santa Catarina State by Loguercio-Leite & Wright (1991).

Phellinus flavomarginatus (Murr.) Ryv., Norw. J. Bot., 19: 234, 1972.

Fomitopsis flavomarginata Murr., North Am. Flora, 9(1): 11, 1907.

Fig. 5.

Basidiomata perennial, resupinate, effuse-reflexed, 5.0 mm thick. Pileus in effsue-reflexed basidiomes yellow (7/8 2.5YR, 7/8 10YR) to dark reddish brown (4/4 5YR). Pore suface yellow to brownish yellow (7/8, 8/8 2.5Y, 6/6 10YR), dark and light yellowish brown (4/ , 6/4 10YR). Pores circular, 5 - 7(-9) per mm, dissepiments thick, entire; tubes pluristratified in old specimens, up to 1,0 mm each layer, yellowish brown, brownish yellow (5/8, 6/6 10YR) to strong brown (5/6 7.5YR), unistratified in young specimens, up to 3 mm deep; context thin, fibrous, dense, shining, concolorous with the tubes, up to 2 mm thick.

Hyphal system dimitic, generative hyphae with hyaline to yellowish, thin to thick walls - mainly in the context, 1.80 - 3.96 µm diam.; skeletal hyphae with thickened walls to solid, yellowish to brown, 3.24 - 4.68 µm diam. Setae ventricose, acuminate, slightly thick to thickened walls, yellowish to brown, 14.40 - 27.0 x 4.32 - 7.56 µm. Basidia clavate, thin-walled, hyaline, 11.52 x 5.04 µm; basidioles 7.20 - 9.36 x 3.60 - 4.32 µm. Basidiospores subglobose to ellipsoid, with thin to thickened walls, yellow, smooth, (3.24-)3.60 - 4.32 x 2.52 - 3.24 µm, IKI-.

Distribution: Neotropical, Cuba, Brazil (Paraná, Santa Catarina). Type locality: Cuba.

Material examinado: BRAZIL, Santa Catarina,

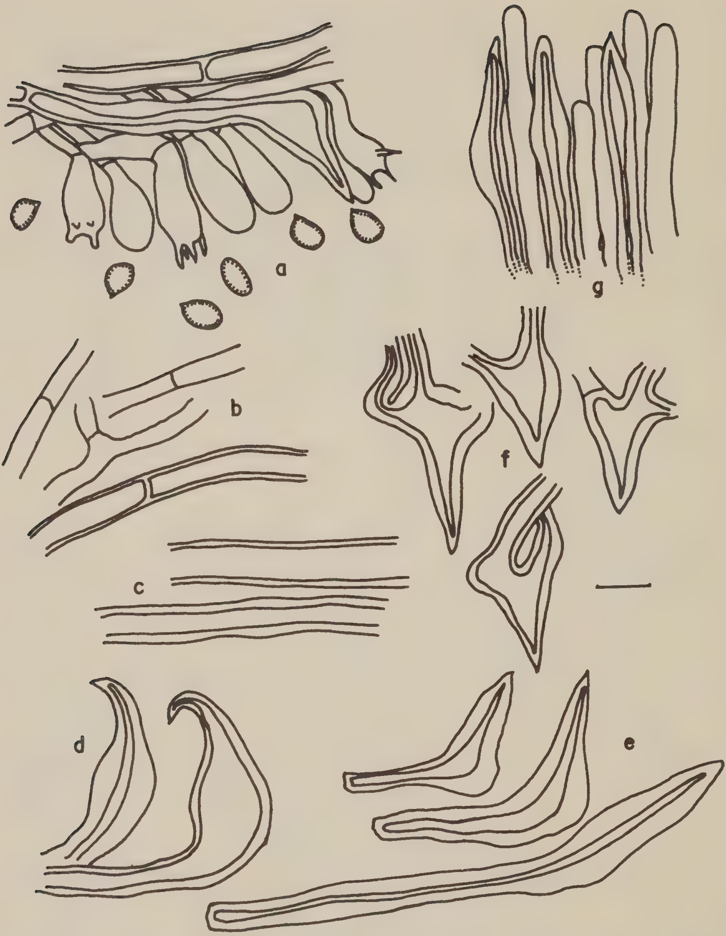

Fig. 5. **Phellinus flavomarginatus.** (a) hymenium and spores; (b) generative hyphae; (c) skeletal hyphae; (d-e) hymenial setae; (f) tramal setae; (g) detail of the dissepiment trama. Scale bar = 5 µm.

Ilha de Santa Catarina, Morro Lagoa da Conceição, Loguercio-Leite & Furlani 190, 193, 199, 26/VII/ 88 (FLOR 10597, 10600, 10604); ibid, ipse, Paraná, Quatro Barras, P. E. Marumbi, Meijer 328, 26/V/87 (BAFC 31031); CUBA, Earle & Murrill 559, 19-20/III/ 1905, ex NY (BAFC 27058).

Remarks: Ryvarden & Johansen (1980) and Gilbertson & Ryvarden (1987) considered this name a synonym of **P. ferrugineo-velutinus** (Henn.) Ryv., in spite of the type of the latter being sterile, as had been already indicated by Lowe (1966). A study of a small portion of the type of **P. flavomarginatus** (BAFC 27058), has shown that the Brazilian material coincides with this species by having spores and setae of similar shapes and sizes. For this reason we considered it valid. Larsen & Lombard (1988) discussed the problems concerned with the nomenclature and types of these two species, but when they described **P. flavomarginatus**, based also on Murrill's type, they affirm that the spores are thin-walled and hyaline in KOH, with which we do not agree. Larsen & Cobb-Poulle (1990) also considered it a valid species. It was first recorded for Brazil by Loguercio-Leite & Wright (1991).

Phellinus gilvus (Schw.) Pat., Essai Tax. Hymen. p. 97, 1900.

Boletus gilvus Schw., Fungi Carol. Super. 2: 70, 1822.

Fig. 6.

Basidiomata perennial to annual, sessile to slightly effuse-reflexed; pileus solitary or imbricate, 20 - 90 x 6 - 50 mm, 1.5 - 4.0 mm deep at the base of the basidiome, dark yellowish brown, yellowish brown to brownish yellow (4/4, 5/6, 6/8 10YR), reddish brown to strong brown (5/4 5YR, 6/8 7.5YR), tomentose to glabrous, frequently rugose, zonate or not; margin concolorous. Pore surface brown to dark brown (5/4, 3/4, 4/4 7.5YR), pores circular, (6-)7 - 10 per mm; dissepiments entire, thick; tubes concolorous, .5 - 2.0 mm deep; context concolorous with the pileus, zonate, fibrous, 1.0 - 2.0 mm thick.

Hyphal system dimitic, generative hyphae with thin walls, yellow brownish, occasionaly branching, 2.16 - 2.88 µm diam.; skeletal hyphae thick-walled, brown, rarely branching, 2.16 - 3.60 (-4.68) µm diam., both context and trama similar.

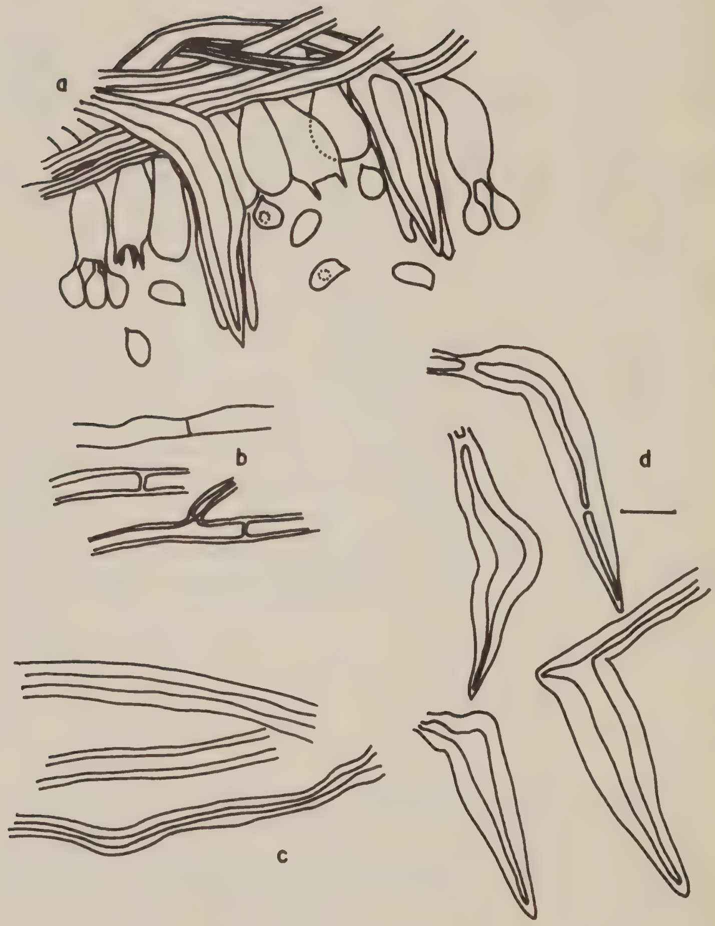

Fig. 6. **Phellinus gilvus.** (a) hymenium and spores; (b) generative hyphae; (c) skeletal hyphae; (d) setae. Scale bar = 5 µm.

Setae subulate, thick-walled, dark brown in KOH, (6.12-)18.0 - 28.80 (-32.04) x 3.60 - 5.76(-7.20) µm. Basidia broadly clavate, thin-walled, hyaline, (6.12-) 8.64 - 9.00 x 3.24 - 3.60(-5.40) µm. Basidiospores ellipsoid to ovoid, hyaline, smooth, 3.60 - 4.32 x 2.16 - 2.52 µm, IKI-.

Distribution: Cosmopolitan. Type locality: North Carolina, USA.

Material examined: BRAZIL, Santa Catarina, Ilha de Santa Catarina, Morro da Lagoa da Conceição, Loguercio-Leite & Furlani 55, 57,61, 63, 68, 13/I/88 (FLOR 10518, 10517, 10523, 10525, 10527); ibid, Lagoa do Peri, ipse 94, 22/I/88 (FLOR 10548); ibid, Morro Lagoa da Conceição, ipse 133, 24/II/88 (FLOR 10578); ibid, ipse 247, 26/VII/88 (FLOR 10632); ibid, ipse 282, 4/VIII/88 (FLOR 10646); ibid, ipse 412, 420, 11/II/89 (FLOR 10726, 10732).

Remarks: This is a polymorphic species, for which reason many collections have been described under many different specific epithets, as seen in the extensive synonymy given by Fidalgo & Fidalgo (1968). Recorded for Blumenau and São Francisco (Bresadola, 1896; Hennings, 1897), it was first cited for the Island of Santa Catarina by Loguercio-Leite & Wright (1991).

Phellinus punctatiformis (Murr.) Ryv., Norw. J. Botany, 19: 235, 1972.

Fomitoporia punctatiformis Murr., Bull. Torrey. Bot. Club. 65: 659. 1938.

Fig. 7.

Basidiomata perennial, resupinate to effuse reflexed, up to 2.0 mm thick. Pileus surface brown, yellowish brown to light brownish grey (5/3, 5/4, 6/2 10YR), margin narrow, sterile, yellow (7/6 10YR); pores circular, 5 - 8 per mm, dissepiments entire, thick, tubes yellowish brown (5/8 10YR), unistratified, 1.0 - 1.5 mm deep; context thin, 5 - 1.0 mm thick, fibrous, concolorous.

Hyphal system dimitic, generative hyphae with thin to slightly thickened-walls, hyaline to pale yellow, 2.16 - 2.52 µm diam.; skeletal hyphae with thickened walls, brown, straight to sinuous, predominating, 3.24 - 5.04 µm diam. Setae ventricose, straight, acuminate, 18.00 - 25.20 x 3.24 - 6.84 µm. Basidia clavate, thin-walled, hyaline, 7.56 x 5.40 µm; basidioles 7.20 - 9.0 x 3.98 - 4.58 µm. Basidiospores subcylindrical, with pointed

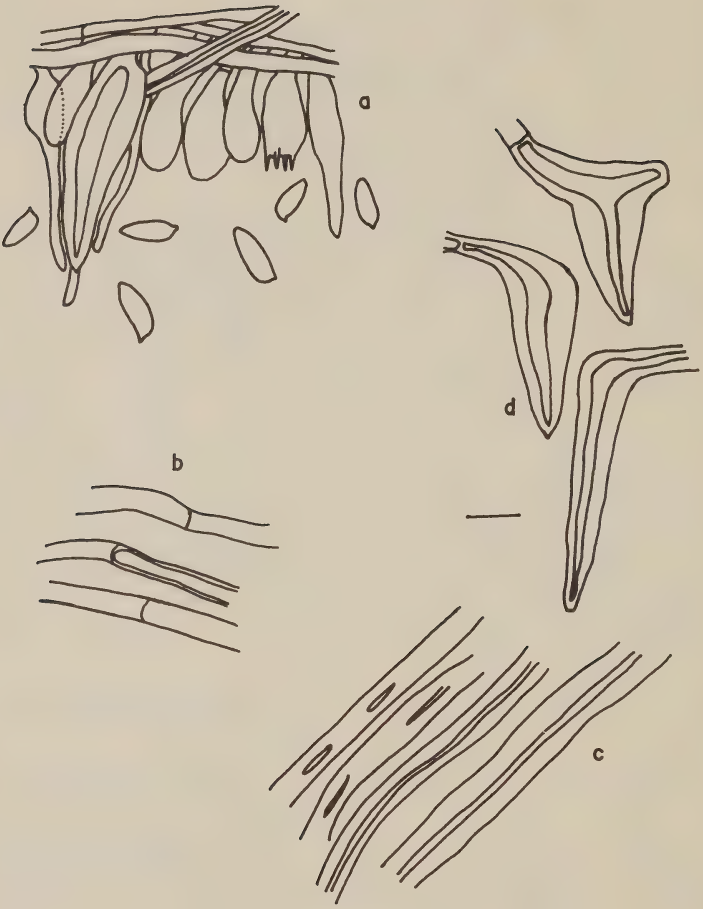

Fig. 7. **Phellinus punctatiformis.** (a) hymenium and spores; (b) generative hyphae; (c) skeletal hyphae; (d) setae. Scale bar = 5 µm.

apex, thin-walled, smooth, 4.32 - 5.04(-6.12) x 1.80 - 2.16 µm, IKI-.

Distribution: Neotropical, USA (Florida), Brazil (Santa Catarina).

Type locality: Florida, USA.

Material examined: BRAZIL, Santa Catarina, Ilha de Santa Catarina, Morro Lagoa da Conceição, Loguercio-Leite & Furlani 62, 13/I/88 (FLOR 10524), ibid, ipse 264, 4/VIII/88 (FLOR 10640); USA, Florida, Cocoa, Rhoads F12073 10/VI/37, ex NY (BAFC 27694).

Remarks: This species can be recognized by its subcylindrical spores with a pointed apex (Ryvarden & Johansen, 1980). Lowe (1966) recorded it for Florida and Brazil, without specifying a locality. The first record for Santa Catarina State was given by Loguercio-Leite & Wright (1991).

Phellinus punctatus (Karst.) Pil., Atlas Champignons Europe, 3, p. 530, 1942.

Poria punctata Karst., Brid. Kannedom Fin. Natur Folk, 37: 03, 1882.

Fig. 8.

Basidiomata perennial, resupinate to broadly effuse-reflexed, woody, difficult to separate from the substrate. Pore surface yellow to yellowish brown (7/8, 5/4 10YR), dull; pores circular, 5 - 7(-9) per mm, dissepiments thick, entire, slightly tomentose; margin yellow (7/8 2.5YR) to brownish yellow (6/8 10YR), tomentose to rimose, up to 1.0 mm wide; tube concolorous with the hymenial surfase, unistratified, up to .5 mm thick; context concolorous with the pore surface, up to 5 mm thick.

Hyphal system dimitic, generative hyphae with thin to thick walls, hyaline, 1.80 - 2.88 mm diam.; skeletal hyphae thick-walled, sometimes branching, 2.52 - 3.96 µm diam., both context and trama similar. Setae absent. Cystidioid elements present, ventricose, thin-walled, hyaline, 19.80 - 21.60 x 3.24 - 3.60 µm. Basidia clavate thin-walled, hyaline, 14.40 - 18.80 x 4.32 - 5.40 µm. Basidiospores ovoid to subglobose, hyaline, smooth, thick-walled, 4.32 - 6.12(-6.84) x 4.32 - 5.04 (-5.76) µm, dextrinoid.

Distribution: Cosmopolitan. Type locality: Norway.

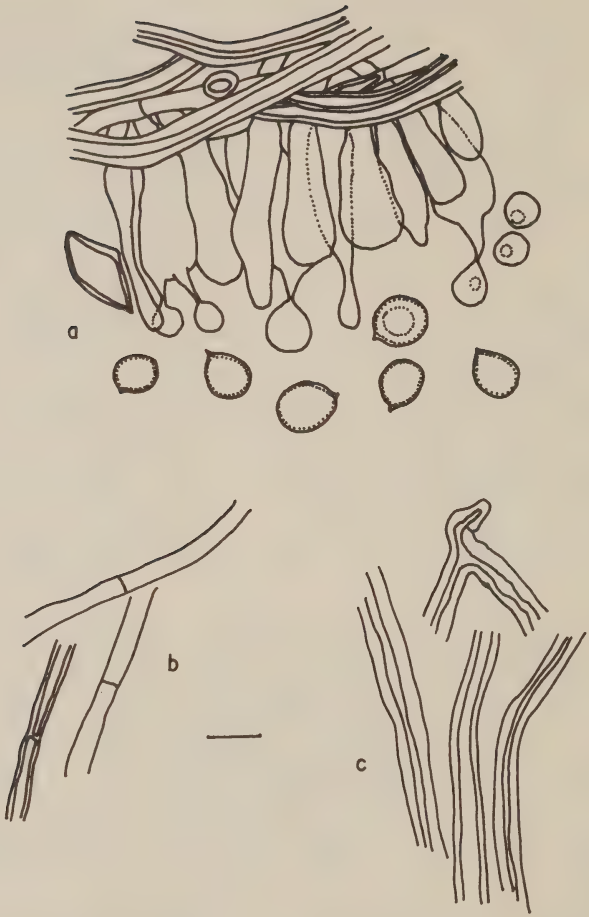

Fig. 8. **Phellinus punctatus**. (a) hymenium and spores; (b) generative hyphae; (c) skeletal hyphae; (d) setae. Scale bar = 5 µm.

Material examined: BRAZIL, Santa Catarina, Ilha de Santa Catarina, Morro Lagoa da Conceição, Loguercio-Leite & Jarenkow 142, 24/II/88 (FLOR 10584); ibid, ipse 252, 26/VII/88 (FLOR 10634); ARGENTINA, Misiones, P. N. Iguazú, Rajchenberg & Job M3665, 8/IV/84 (BAFC 30163).

Remarks: The species is very similar to **P. hartigii** (Allesch. & Schnabl) Pat. which has effuse-reflexed basidiomes and grows on living conifers (Gilbertson, 1979). Its resemblance to the **P. robustus** complex was noted by Lowe (1966) and Gilbertson (1979). The former author considers the present species to be a resupinate form of **P. robustus** (Karst.) Boud. & Galz., which is pileate. Larsen & Cobb-Poulle (1990) in their survey of the genus **Phellinus** considered **P. punctatus** (Fr. ex Karst.) Pilat as a valid name for the species. Ryvarden (1981) stated that the original spithet was published as **P. punctatus** Jungh. (=**Rigidoporus lineatus**) in 1838, whereby **P. punctatus** Fr. published in 1874 is a later homonym and illegitimate. However, according to Ryvarden (1991, p. 314) Karsten in 1882 erected the binomial **Poria punctata**, which should be the basionym for the present taxon, namely **Ph. punctatus** (Karst.) Pilát. We have adopted Ryvarden's criterion of using the latter authorship for the binomial.

Phellinus umbrinellus (Bres.) Herrera & Band., Mikol. Fitopatol., 14(1): 8, 1980.

Poria umbrinella Bres., Hedwigia, 35: 282, 1896.

Fig. 9.

Basidiomata perennial, resupinate to effuse-reflexed, not separable from the sustrate; young specimens circular, 6 mm diam., later fusing up to 40 mm long. Pore surface light yellowish brown, light olive brown, yellowish brown (6/4, 5/4 2.5 Y; 5/4 10YR); margin sterile, mycelial, yellow (7/6 2.5YR; 8/8 10YR), very evident, up to 2.0 mm wide; pores circular to slightly angular, 5 - 8 per mm, on vertical surfaces wider, 4 - 5 per mm; dissepiments thin, entire; tubes pluristratified, 1.0 - 2.5 mm deep, concolorous with the pores, stuffed with white mycelium; context very thin to absent, distinct between tube layers, strong brown (5/6 7.5YR), in the upper stratum compact, with a black line above.

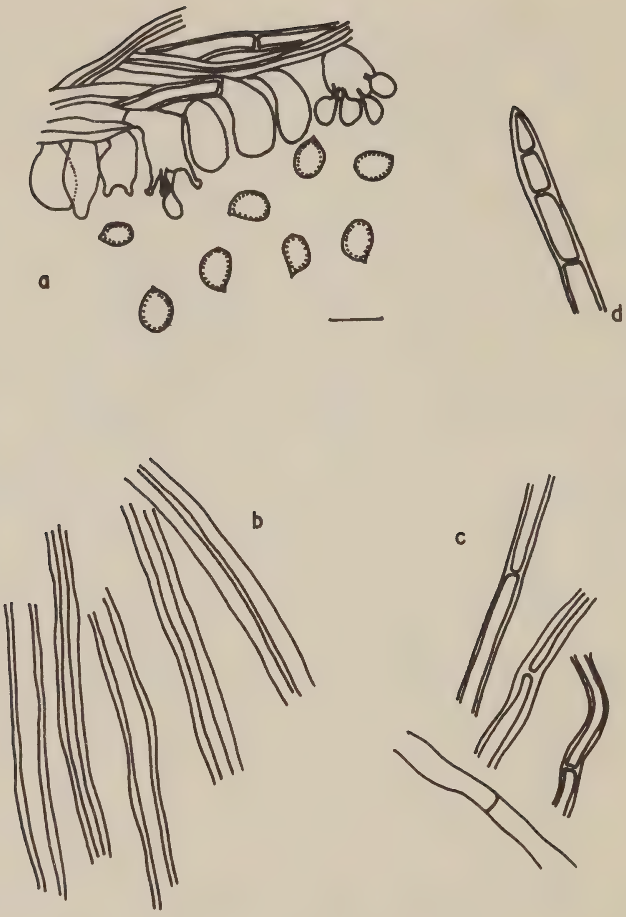

Fig. 9. **Phellinus umbrinellus**. (a) hymenium and spores; (b) generative hyphae; (c) skeletal hyphae; (d) detail of the dissepiment trama. Scale bar = 5 µm.

Hyphal system dimitic, generative hyphae with thin to slightly thickened walls, hyaline to yellow, 2.16 - 2.52 µm diam.; skeletal hyphae thick-walled, ferrugineous to reddish brown in KOH, slightly tortuouse, 2.52 - 4.60 µm diam.. Setae absent. Basidia clavate, short, thin-walled, hyaline, 7.20 - 7.56 x 4.32 - 5.4 µm. Basidiospores oblong-ovoid to ovoid, thick walled, ferrugineous brown, 3.60 - 4.32 x 2.88 - 3.60 µm, IKI-.

Distribution: Pantropical, USA, Mexico, Nicaragua, Costa Rica, Cuba, Bahamas, Jamaica, Haiti, Bolivia, Brazil (Santa Catarina, Paraná), Galapagos, Islands, Sierra Leone, New Zealand. Type locality: Santa Catarina, Brazil.

Material examined: BRAZIL, Santa Catarina, Ilha de Santa Catarina, Morro Lagoa da Conceição, Loguercio-Leite & Furlani 12, 7/VIII/87 (FLOR 10495); ibid, Córrego Grande, Poção, ipse 43, 11/VIII/87 (FLOR 10508); ibid, ipse 422, 11/II/89 (FLOR 10734); ibid, Paraná, Curitiba, R.E. Cambui, Meijer 766, 18/II/87 (BAFC 31303); ibid, Santa Catarina, Moller, ex NY 4876 - holotype (BAFC 27717).

Remarks: The species can be recognized by its effuse-reflexed basidiomes, small spores, absence of setae and very abundant ferrugineous brown spores, features observed in BAFC 27717 and stressed by Gilbertson & Ryvarden (1987). The measurements of our spores coincide with those given by Murrill (1907) and Lowe (1966), and the number of pores per mm agrees with those recorded by Gilbertson & Ryvarden (1987). It has been recorded for Santa Catarina by Bresadola. (1896), and for the first time specifically for the Island of Santa Catarina by Loguercio-Leite & Wright (1991).

Phellinus undulatus (Murr.) Ryv., Norw. J. Bot., 19(3-4): 235, 1972.

Fomitiporia undulata Murr., North America Flora, 9: 10, 1907.

Fig. 10.

Basidiomata annual to perennial, resupinate to effuse-reflexed, up to 4.0 mm thick. Pore surface brown to light yellowish brown (5/4, 6,4 10 YR), dull, margin, when present velutine yellow (7/8 10YR); angular, 6 - 7(-8) per mm; dissepiments thin, entire; tubes concolorous with

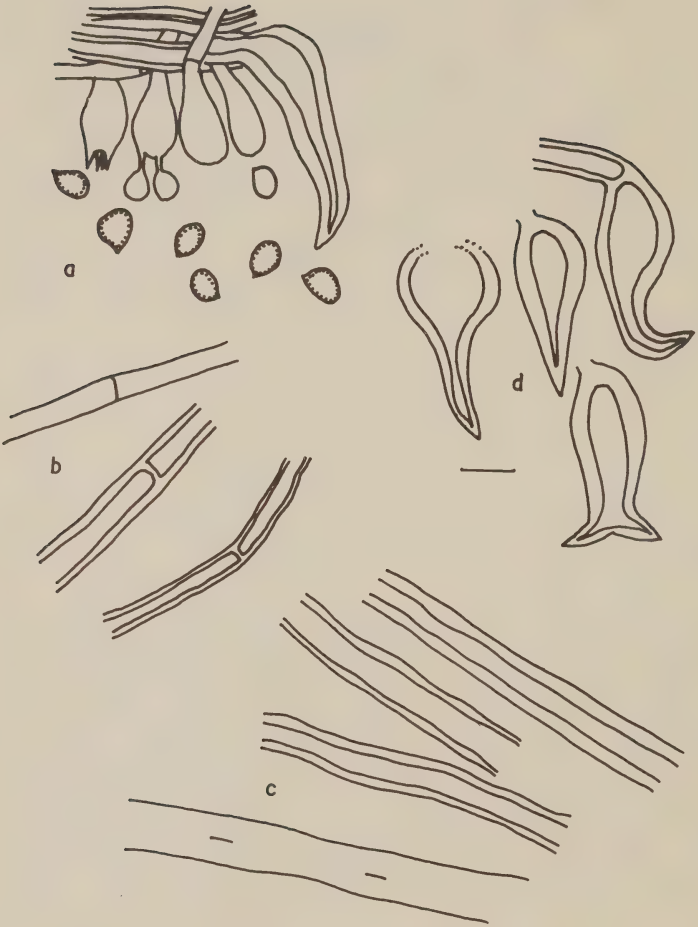

Fig. 10. **Phellinus undulatus.** (a) hymenium and spores; (b) generative hyphae; (c) skeletal hyphae. Scale bar = 5 µm.

hymenial surface, up to 3.0 mm long.; context very thin, firm, fibrous, yellowish brown (5/6 10 YR).

Hyphal system dimitic, generative hyphae thin-walled, hyaline, 1.80 - 2.16 µm diam.; skeletal hyphae thick-walled, yellowish brown, 2.52 - 3.60 µm diam., predominating. Setae subventricose, acuminate, abundant, straight or hooked, 19.80 - 24.48(-52.20) x 5.04 - 7.20(-8.64) µm. Basidia clavate, thin-walled, hyaline, 9.0 - 9.68 - 5.04 µm. Basidiospores broadly ellipsoid, slightly thick-walled, pale yellow, smooth, 3.60 - 4.32 x 2.88 - 3.60 µm, IKI-.

Distribution: Neotropical, Guyana, Martinica, Argentina (Misiones), Brazil (Santa Catarina). Type locality: Guyana.

Material examined: BRAZIL, Santa Catarina, Ilha de Santa Catarina, Morro Lagoa da Conceição, Loguercio-Leite & Furlani 120, 5/II/88 (FLOR 10567); ARGENTINA, Misiones, P. N. Iguazú, Job & Rajchenberg M3618, 6/IV/84 (BAFC 29801): MARTINICA, David, 7/X/76, dupl. LYAD 2229 (BAFC 31980).

Remarks: The Brazilian material is very similar to that studied by David & Rajchenberg (1985) since the spores are light yellowish, and have slightly thickened walls, similar to those of **P. cesatii**. This character was not recorded by Ryvarden & Johansen (1980) who described the spores as hyaline and thin-walled. It was first recorded for Brazil by Loguercio-Leite & Wright (1991).

Phellinus wahlbergii (Fr.) Reid, Contrib. Bol. Herb., 7: 97, 1975.

Trametes wahlbergii Fr., Kongl. Svenska, Vet. p. 131, 1848.

Fig. 11.

Basidiomata perennial, pileate, applanate, single or imbricate, rarely effuse-reflexed, semicircular, 20 - 160 mm x 15 - 150 mm. Pilear surface brown, strong brown, dark yellowish brown to yellowish brown (4/4, 5/8 7.5YR; 4/4, 5/4 10YR), concentrically sulcate, whit narrow zone, some adpressed, others tomentose. Pore surface brown to strong brown (4/4, 5/6, 5,8 7.5YR); pores circular, (5-)4 - 9 per mm, dissepiments thick, entire, tubes uniito pluristratified (near the base), strong brown to redish yellow (5/8, 6/6 7.5YR), 2 - 10 mm deep; context fibrous, concolorous, 2 - 6 mm

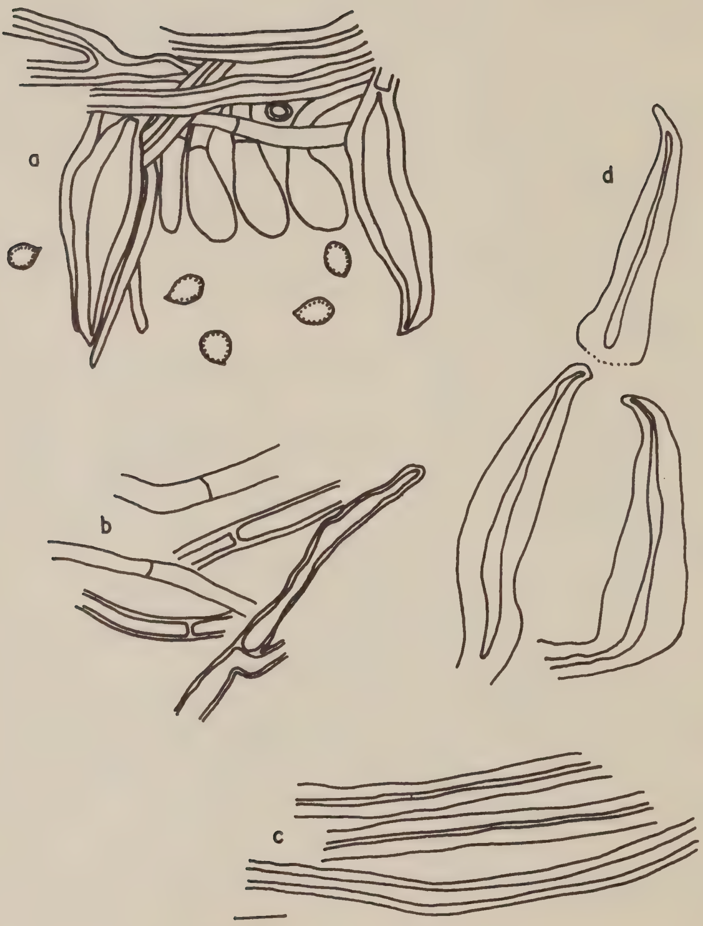

Fig. 11. **Phellinus wahlbergii**. (a) hymenium and spores; (b) generative hyphae; (c) skeletal hyphae; (d) setae. Scale bar = 5 µm.

deep.

Hyphal system dimitic, generative hyphae with to thick walls, hyaline to yellowish, branching 1.80 - 2.88 µm diam.; skeletal hyphae thick-walled, brown, unbranched, 2.52 - 3.60 µm diam.. Setae ventricose and/or uncinate, thick-walled, brown, 19.80 - 28.80(-36.0) x 5.40 - 7.20 (-7.92) µm. Basidia not observed. Basidioles clavate thin-walled, hyaline, 9.72 - 10.80 x 5.04 - 5.76 µm. Basidiospores subglobose, with thin to slightly thickened walls, hyaline to pale yellow, 3.24 - 3.98 x 2.52 - 3.60 µm, IKI-.

Distribution: Pantropical, Argentina (Misiones), Brazil (Santa Catarina, Rio de Janeiro, Rio Grande do Sul), Chile, Puerto Rico, Trindad, Cuba, USA, Australia, New Zealand, Asia, South Africa, Kenya, Ethiopia. Type locality: Natal, South Africa.

Material examined: BRAZIL, Santa Catarina, Ilha de Santa Catarina, Morro Lagoa DA Conceição, Loguercio-Leite & Furlani 30, 7/VIII/87 (FLOR 10500); ibid, ipse 52, 53, 13/I/88 (FLOR 10517, 10520); ibid, ipse 112, 5/II/88 (FLOR 10559); ibid, ipse 214, 221, 26/VII/88 (FLOR 10613, 10617); ibid, ipse 323, 20/X/88 (FLOR 10667); ibid, Rio de Janeiro, Floresta da Tijuca, Plank & Broggi 3454, 14/I/81 (BAFC 26555); ARGENTINA, Misiones, Ca. Gral. Belgrano, Gomez, VII/65 (BAFC 24355).

Remarks: Among the pileate species of **Phellinus**, the present one can be recognized microscopically by the presence of uncinate setae mixed with ventricose ones with straight apices (Ryvarden & Johansen, 1930; Gilbertson & Ryvarden, 1987). The first record for Brazil was given by Loguercio-Leite & Wright (1991).

CONCLUSIONS

The eleven species studied from the Island of Santa Catarina exhibited differente distribution patterns. Of these only **P. umbrinellus** (whose holotype is from Santa Catarina) was cited by Bresadola (1896), whereas the remaining ones were recorded by Loguercio-Leite & Wright, 1991.

Phellinus ferreus, **P. punctatus** and **P. gilvus** are cosmopolitan, the former two being described for the first time for the State of

Santa Catarina, and the latter for the Island.

The remaining species have a tropical distribution, P. **apiahynus**, P. **puntatiformis**, P. **flavomarginatus** and P. **undulatus** being neotropical; the last two are described for the first time for Brazil. The rest (P. **callimorphus**, P. **cesatii**, P. **umbrinellus** and P. **wahlbergii**) are pantropical, the first three are described for the first time for Brazil.

ACKNOWLEDGMENTS

We would like to think Drs. James Ginns (Ottawa) and Michael Larsen (Madison) for the exhaustive review and invaluable criticism.

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MYCOTAXON

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VALIDATION OF THE PUFFBALL GENUS *CALBOVISTA*

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SUMMARY

The monotypic genus *Calbovista* was originally published invalidly (Morse 1935), lacking a Latin description. Herein is provided the necessary Latin for both the genus and species thus validating these taxa. A brief discussion is presented regarding relations at the generic level.

INTRODUCTION

Calbovista is a well known monotypic puffball genus of higher elevations, occurring in the western mountains of North America following snowmelt. The known distribution includes the following mountain ranges: Cascades, Sierra Nevada, Olympics, Rocky Mountains and mountains of northern Idaho. Originally published in 1935 by Elizabeth E. Morse, the genus is invalid due to the absence of a Latin diagnosis. According to the International Code of Botanical Nomenclature (Greuter et al. 1988), the name of a new taxon published on or after 1 January 1935, must be accompanied by a Latin description (*article* 36.1). The necessary Latin diagnoses are supplied herein, thus validating the previously described monotypic genus. *Calbovista* has been exclusively used for this taxon by various workers during the past 60 years (Seaver & Shope 1935; Zeller 1947, 1948, 1949; Smith 1963, 1975; Miller 1977; Smith, Smith & Weber 1981; Lincoff 1981; Arora 1986; McKenney & Stuntz 1987; McKnight & McKnight 1987; Miller & Miller 1988; States 1990, Kreisl 1992), thus the name will be conserved.

Type specimens are deposited at the University of California, Berkeley Herbarium (UC[1]). Microscopic examinations involved sections mounted in water, 3% potassium hydroxide solution and Melzer's reagent (I_2KI in chloral hydrate solution).

Calbovista Morse ex Seidl, gen. nov.

Sporophorum modicum vel magnum, cremeum, turbinatum, farctum, basi in rhizomorphas in solo situ desinente. Peridium bistratum: externum crassum, coriaceum, in laminas pyramidales fractum, maturitate deciduas primum apicales

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[1] Acronyms used according to Holmgren, P. K., N. H. Holmgren & L. C. Barnett. 1990. Index Herbariorum. A guide to the location and contents of the world's public herbaria. I: The herbaria of the world. Regnum Vegetabile 120:1-693.

demum inferiores; interius tenue. Columella absens. Gleba fragilis, matura atroumbrina. Subgleba distincta, crassa. Capillitium abundans, discretum, ochraceum, ramosum instar cornuum, imbricatum, non foveatum. Basidia tetraspora. Sporae globosae, 3-5 µm diametro, cumulo ochraceo-brunneae, verrucosae, pedicello, hyalino praeditae. Basidiocarpia epigaea. Singillatim vel gregarie in regionibus subalpinis vel alpinis, mensibus ab Aprili ad Augustam. Saximontanis vel plus occidentalibus.
HOLOTYPUS. *Calbovista subsculpta* Morse ex Seidl (**UC 525436**).

Sporocarp medium to large, cremaceous, round to ovoid, becoming turbinate; columella lacking; sterile base present and ending in soil-embedded rhizomorphs. Peridium two-layered: apical pore lacking, exoperidium thick, coriaceous, breaking up into areolate patches with blunt, truncate, pyramidal warts or plates, which fall away from top downward at maturity, endoperidium thin becoming irregularly lacerate. Gleba dark brown to purplish brown or umber at maturity. Subgleba distinct, thick. Capillitium abundant, of discrete units, with false septa, ochraceous yellow, with short, small, pointed side branches, surface perforations lacking. Basidia four-spored. Spores globose, 3-5 µm in diameter, ochraceous brown to dark brown in mass, verrucose, pedicellate with hyaline pedicel.
Habit and Distribution. Basidiomes epigeous. Solitary to gregarious, in subalpine to alpine habitats, Rocky Mountains and west (see paragraph 1 of introduction), April to August.

Calbovista subsculpta Morse ex Seidl, sp. nov.

Calbovista subsculpta Morse, Mycologia 27:96-101, 1935, nom. nud. (absque diagn. lat.).

Sporocarpium 6-16 cm diametro, pallidum vel cremoricolore, denique pallide luteo-brunneum. Peridium bistratum, utrumque usque ad 1 cm crassum, in areolas enormes ruptum. Gleba immatura alba, maturitate atroumbrina vel purpureo-umbrina. Sporae globosae, 3-5 µm diametro, verrucosae, pedicellatae, pedicello ad 3.0 µm longitudines, cumulo ochraceo-brunneae vel atrobrunneae. Singillatim vel gregarie, nonnunquam caespitose in regionibus subalpinis vel alpinis, mensibus Aprili ad Augustum, Saximontanis vel plus occidentalibus.
HOLOTYPUS: Soda Springs, comitatus Nevada, civitatis Californiae, altitudine 6767 passuum, 9.V.1934, leg. W. H. Sanders, in **UC** sub numero **525436** conservatus.

Sporocarp 6-16 cm broad, pallid to cream color, becoming light yellow brown in age. Peridium of two layers, up to 1 cm thick, exoperidium forming areolate patches which rupture irregularly. Gleba white when immature, becoming dark brown to purplish brown at maturity. Spores globose, 3-5 µm in diameter, verrucose, pedicellate with pedicel up to 3.0 µm long, ochraceous brown to dark brown in mass.
Habit and Distribution. Solitary to gregarious, occasionally caespitose, in subalpine to alpine habitats; Rocky Mountains and west (see paragraph 1 of introduction), April to August.

Holotype: North America, USA, California: Soda Springs, Nevada County, W. H. Sanders (UC 525436), 9.v.1934, elevation 6767 feet.

According to Morse (1935), the original description was based on a composite which she collected between May 7-23, 1934. Type material was deposited in the UC herbarium as no. 525436. Handwritten on the outside of this boxed collection are the following notes: collected by W. H. Sanders at railroad staion close to summit; det. E. E. Morse; type. It does not appear to be a composite as stated in the 1935 (Morse) publication. After examination of this material, the Sanders collection UC 525436, was chosen as the type for this taxon.

Comments. The genus *Calbovista* is characterized by a two layered, thick peridium, the exoperidium breaking up into blunt, truncate, pyramidal warts, the presence of a large sterile base, and branched capillitium which lacks perforations and has pointed apices. As Morse originally stated (1935), the name *Calbovista* suggests alliance with *Calvatia, Bovista* and *Bovistella*. The peridium is similar to *Calvatia,* yet the capillitium of *Calbovista* sets it apart by having short, tapered to pointed, small side branches, and is never perforated. The deep, sterile, rooting base and the capillitium of discrete units compares closely with *Bovistella*, but the endoperidium of *Calbovista* lacks a pore, is not tough in consistency, nor metallic or silvery in coloration. The branched capillitium resembles that of *Bovista*, *Bovistella* and *Mycenastrum. Bovista* differs by lacking a sterile base, possessing a fragile exoperidium that eventually sloughs off, and the basidiome becomes detached from the substrate at maturity. *Mycenastrum* differs by having a smooth exoperidium, an inner peridium which splits stellately at maturity (Zeller 1949), and intricately branched capillitium with multiple, terminal spine-like processes.

Alexander H. Smith (1965) described a variety, *C. subsculpta* var. *fumosa*, based primarily on the gray coloration of the outer peridium and the formation of very rudimentary squamules. This infraspecific taxon is only known from the type locality, and certainly warrants further study to determine its proper placement. However, it is invalid since it was based on an invalid genus name.

The genus *Calbovista* has been placed in the family Lycoperdaceae, order Lycoperdales by various workers (Kreisl 1992; Miller & Miller 1988; Smith, Smith & Weber 1981). Other workers have placed *Calbovista* in the Mycenastraceae along with *Mycenastrum* (Zeller 1948, 1949). Zeller (1948) erected the family Mycenastraceae to include *Calbovista* and *Mycenastrum*, which is united by the presence of capillitial threads having short, spine-like or pointed side branches. There has been no conflicting publications regarding where *Calbovista* belongs at the ordinal level. There is some question as to which family it belongs, but recent workers place it in Lycoperdaceae. With the advent of molecular techniques, perhaps a better idea of its relations to other members of the Lycoperdales can be established.

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MYCOTAXON

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THE PSILOPEZIOID FUNGI. IX.[1] *PACHYELLA HABROSPORA*, A NEW SPECIES FROM BRAZIL.

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The recent history of the genus *Pachyella* Boudier is easily summarized. Pfister (1973) included six species in the genus as he emended it. Additional species were treated by Pfister and Candoussau (1981). Baral, Jahn, and Lohmeyer (1981) discussed several European collections. A new species *Pachyella lazzariana* Trimbach (1990) was described. In this paper one more species is described based on the study of a large collection sent by A. de Meijer from the area around Curitiba, Brazil.

Pachyella habrospora D. Pfister, **sp. nov.**, Figs. 1-5

Species haec ab Pachyella megalosperma Le Gal *differt ascosporibus minoribus, reticulis quoque magnibus.*

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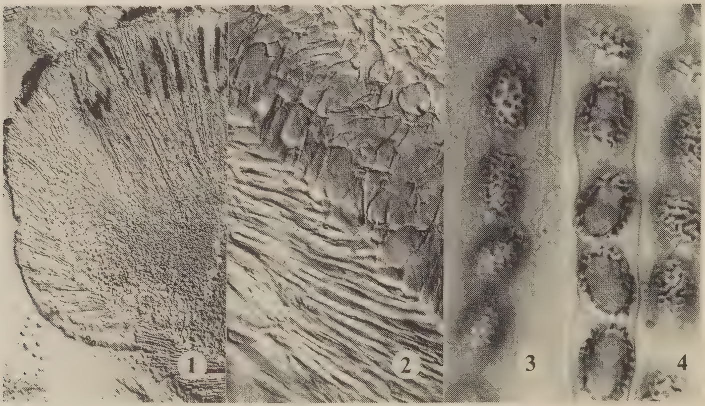
[1] Under this series title papers were published as follows: I. Mycologia 65:321-328. 1973; II. Bull. Torrey Bot. Club 99: 198-200. 1972[1093]; III. Amer. J. Bot. 60: 355-365. 1973; IV. Can. J. Bot. 51: 2209-2023. 1973; V. Can. J. Bot. 52: 1643-1645. 1973; VI. Mycologia 67: 181. 1974; VII. Mycotaxon 13: 367-368. 1981; VIII. Mycotaxon 13: 457-464. 1981.

Ascomata sessile, flat, up to 15 mm broad, hymenium dark brown, drying to black; outer surface white, smooth. Flesh up to 2 mm thick. Outer excipulum about 100 μm thick, built up of 3-5 cylindrical to angular cells, up to 30 μm long and 10 - 20 μm wide, arranged with their long axis perpendicular to the outer surface of the ascomata. The outer most cells of this layer gives rise to hyphoid, sparingly septate hairs up to 140 μm long and 6 μm wide, hairs embedded in a continuous gelatinous matrix. The hairs form a palisade on the outer surface more or less continuous with the hymenium. Medullary excipulum about 400 μm thick at the base composed of rather tightly woven textura intricata the cells of which range up to 10 μm in diam. Subhymenial region indistinct. Asci 370-400 x 19-20 μm lightly J+ over the entire length. Ascospores bigut-



Figs. 1 - 4. Holotype of *Pachyella habrospora*. 1. Cross-section of an ascomata, x100. 2. Portion of outer excipulum showing elongate angular cells and the hyphoid hairs in gelatinous matrix, x400. 3 and 4. Ascospores in asci, x1000.

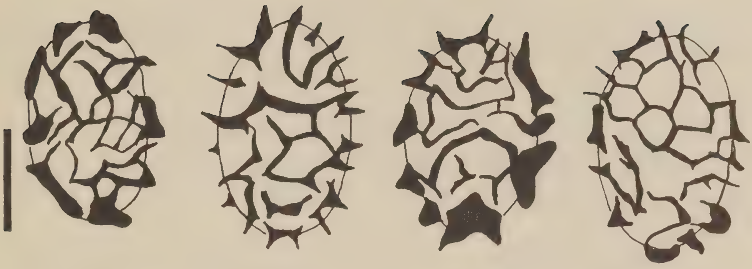


Fig. 5. Holotype of *Pachyella habrospora*. Ascospores, scale = 10μm.

tulate, broadly ellipsoid, 21-23 x 11 - 12 μm, exclusive of ornamentation. Markings about 1.6 μm high, in the form of interconnecting ridges which form a partial reticulum. Paraphyses about 5 μm wide below and up to 8 μm at the apex, within containing amorphous granules.

On decayed dicotolydenous trunk in seasonal semi-deciduous forest.

HOLOTYPE: Parque Regional do Iquacu, Zoológico. Paraná, Curitiba, Brazil. 27 Nov. 1990. A. de Meijer (no. 1872). **FH**. ISOTYPE in **MBM**.

The name is derived from *Habro-*, meaning pretty, graceful, dainty and *-spora*, spore.

This species is closely allied to those which form a discrete palisade layer of hyphoid hairs on the outer surface. Central among these species are *Pachyella clypeata* (Schw.) Le Gal and *P. violaceonigra* (Rehm) Pfister. Most of the large species of the genus fall in this group which includes: *P. adnata* (Berk. & Curt.) Pfister, *P. peltata* Pfister & Candoussau, *P. megalosperma* (Le Gal) Pfister, and *P. pseudosuccosa* (Le Gal) Pfister (= *P. aquatilis* (Perthet & Donadini) Donadini).

Pachyella habrospora differs from all of these in spore ornamentation. The only species in which spore ornamentation approaches a reticulum is *P. megalosperma* in which the spores are larger, 22.5 -28.5 x 10.5-14.5 µm and in which the ornamentations are both more regular and less high.

This collection of *P. habrospora* was originally identified as a *Peziza* in the field and indicates that species of this well-defined genus may still be found among general collections particularly where the flora is poorly known.

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MYCOTAXON

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NIEBLA TUBERCULATA (RAMALINACEAE): A NEW LICHEN FROM CALIFORNIA

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ABSTRACT: *Niebla tuberculata* Riefner, Bowler, Marsh and Nash is described from California.

INTRODUCTION

This is one in a series of articles discussing the taxonomy, nomenclature, chemistry, and ecology of the genus *Niebla* in western North America. *Niebla tuberculata* Riefner, Bowler, Marsh and Nash is described from Morro Rock Reserve, San Luis Obispo County, California.

Niebla tuberculata Riefner, Bowler, Marsh & Nash *sp. nov.* (Figures 1-2).

TYPE: USA. California. San Luis Obispo Co.: On dacite cliffs of Morro Rock Reserve, Morro Bay, 1993, *Riefner 93-8* (Holotype: IRVC; Isotypes: ASU, WIS); contains usnic acid, unidentified triterpenes.

DESCRIPTION: *Thallus fruticosus, conferte aggregatus ad 5 cm longus, caespitosus rigidus fruticosusque, cladinaformus. Rami rigidi erectus, subcylindrici,* *compressi solidique, rami lati ad 1-5 cm diam, tubercularis isidiose-papillatis laminalibus linearibus, soralia nulla. Medulla alba, cordus centralis friabilus. Cortex rigidus, flavovirens. Apothecia marginalia, terminalia vel subterminalia, plana vel convexa, discus pallidus 6 mm max. diam. Sporis uniseptalis, rectis vel curvulis, 11-14 μm x (3) 4-5 μm. Substratum: saxum.*

Thallus saxicolous, cladinaform to bush-like, branches rigid, erect, angular to flattened, to 5 cm in height, occasionally with some bifurcate branching of terminal segments. Abundant sub-terminal branching, with many main branches arising from a basal attachment point. Branches ranging from flattened or angular to cylindrical, 1 to 5 mm in width. Medulla white with a coalesced central chondroid strand in larger branches. Cortex greenish, greenish-yellow to brown, rigid, conspicuously isidiose-papillate, papillae often bearing black pycnidia at the apices, and with small sub-terminal isidia-like protuberances arising like horns from the cortex. Tuberculate papillae circular, disposed the length of the branches, exposing the white medulla, soralia absent. Apothecia disks pale, nearly white, plane to convex when mature, cupped when developing, margin entire, to 6 mm in width, terminal or sub-terminal and usually marginal, often in clusters of two to four, margins occasionally with isidia-like spurs. Spores uniseptate, ellipsoid, 11-14 μm x (3) 4-5 μm, straight or gently curved.

CHEMISTRY: Usnic acid, unidentified triterpenes (possibly including zeorin).

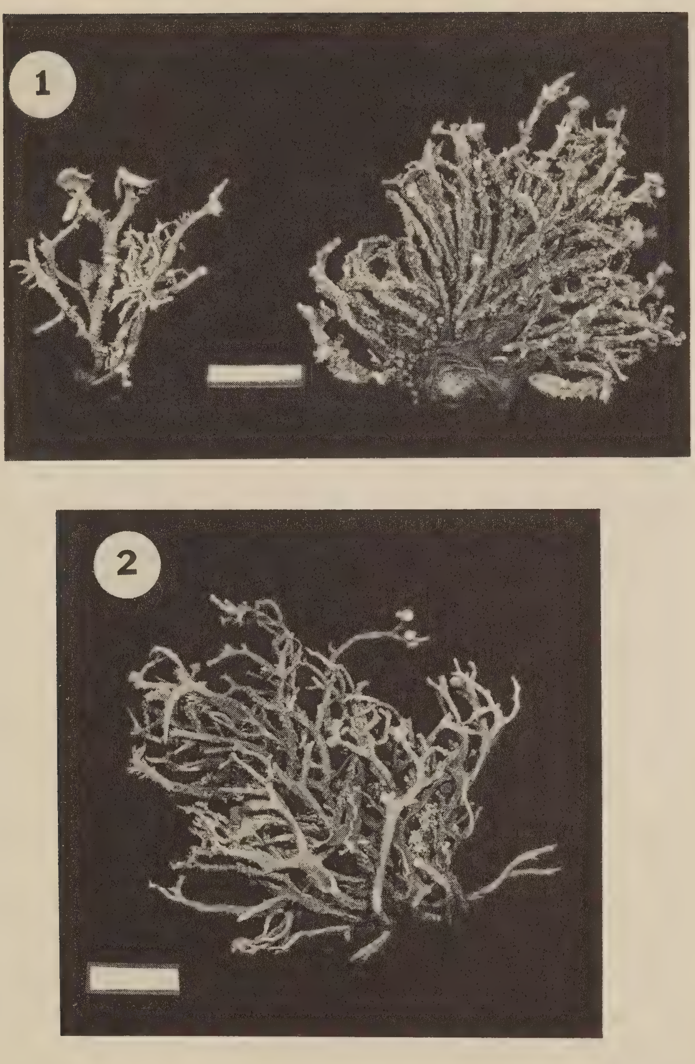
DISTRIBUTION: Endemic to California, known only from Morro Rock Reserve, San Luis Obispo Co.

> **REPRESENTATIVE SPECIMENS EXAMINED:** USA. CALIFORNIA. SAN LUIS OBISPO CO.: Morro Rock Reserve, Morro Bay, *Riefner 93-8* (IRVC, ASU, WIS); *Riefner 93-10* (IRVC).

Niebla tuberculata is characterized by: 1) being saxicolous; 2) having terminal/sub-terminal ± marginal apothecia on angular to flattened, or terete branches; 3) having uniseptate spores straight to gently curved, 11-14 μm x 3-5 μm; 4) being isidiose-papillate, the papillae often developed upon tubercules and conspicuously tipped with black pycnidia; 5) possessing a central mass or thickened strands of agglutinated hyphae; 6) a triterpenoid chemistry lacking diterpenes, depsidones, and para or meta-depsides.

Niebla combeoides (Nyl.) Rundel and Bowler, and *Desmezieria ceruchoides* Follm. and Hun. (a nomen nudum that will be redefined in the near future; Bowler et al., in prep.) are other saxicolous species with terminal and/or sub-terminal apothecia with terete to angular branches that might be confused with *N. tuberculata*. These taxa produce floccose deposits that extrude between cracks in the cortex with age. The mold-like appearance of this deposit has been attributed to the presence of ceruchdiol (Bendz et al., 1965), a diterpene that is absent or the concentrations too low to be detected by TLC in *N. tuberculata*. Also, neither of these taxa produces isidiose-papillae that are characteristic of *N. tuberculata*.

Niebla combeoides is also easily separated by the absence of a coalesced central mass of chondroid strands, the common occurrence of terminal apothecia (usually one per blade) on unbranched stalks, different chemotypes including the



Figures 1-2. Figure 1. Type collection of *Niebla tuberculata*. Figure 2. Bush-like morphology. Bar = 1 cm.

content of ± salazinic acid ± zeorin, and a rugose cortex. Otherwise *N. combeoides* also has a similar thickened cortex much like that of *N. tuberculata*.

Desmezieria ceruchoides is an easily recognized taxon, and is distinguished from *N. tuberculata* by its caespitose habit that lacks a distinct holdfast, and bifurcate branched apices; it is rarely fertile having spores 10-13 μm x 3-4 μm. Bush-like morphologies of *D. ceruchoides* may superficially resemble *N. tuberculata* but lack its roughened papillate cortex and more strongly flattened branches.

Niebla robusta (R.H. Howe) Rundel and Bowler also occurs within the saxicolous community in this region of the Pacific fog-belt and is identified readily by its squat, inflated branches, terpenoid chemistry (including zeorin) ± salazinic acid, and shorter spores measuring 10-12 μm in length. *Niebla robusta* also lacks the central strands of agglutinated hyphae found in *N. tuberculata* and has a puffy, cottony medulla most similar to *N. ceruchis* (Ach.) Rundel and Bowler. Although Howe (1913) considered *N. robusta* to be a variety of *N. combeoides*, the medullary characteristics shared between *N. robusta* and *N. ceruchis* may reflect a closer evolutionary relationship between these two species than previously considered.

There is another locally common, but undescribed, saxicolous taxon with slender tubular branches that also shares the same anatomical medullary characteristics of the *N. ceruchis-robusta* group. It is readily distinguished by the presence of terminal capitate clusters of small apothecia and the usual content of salazinic acid (Bowler et al., in prep.).

The angular blade-like morphology of *N. tuberculata*, and the presence of the central mass (often cord-like in larger branches) of agglutinated strands of hyphae (interpreted as mechanical and moisture retention tissue) in *N. tuberculata* may imply an evolutionary history allied to the hypothetical saxicolous Ramalinoid group ancestral to *Niebla* previously postulated by Bowler (1981). Taxa of the *Niebla homalea* group, also having angular to flattened blades, are recognized anatomically by the presence of distinct chondroid strands in the medulla (Bowler 1981) which serve as an aid in identifying immature specimens.

Usnea subfusca Stirton also occurs in central California and may superficially resemble *N. tuberculata* in having a central cord and a thallus deformed by isidiate tubercules. It may be distinguished by its non-septate spores, a K+ medulla, and an elastic central cord.

Niebla tuberculata is locally abundant above the supralittoral zone on the fog-shrouded sea cliffs and outcrops of Morro Rock Reserve. It has not been found elsewhere on the mainland, but is to be expected on the Channel Islands. Other California lichen endemics, such as *Caloplaca brattiae* W. Weber, exhibit a disjunct distribution pattern that includes Morro Bay and the offshore Islands (Weber 1989). Morro Rock (historically an island at the entrance to Morro Bay since the last glacial) is an ancient volcanic plug 581 feet in height that has been dated at 22 million years BP (Daughtery 1986). *Niebla tuberculata* and related taxa may be relicts (paleoendemics) of moister climatic regimes occurring prior to the emergence of the xeric Mediterranean type of climate in the mid-Miocene (Axelrod 1989), and may now be restricted to mesophytic refugia. Stebbins and Major (1965) correlated the presence of relict species occurring in California to mesic regions influenced by relatively high warm season precipitation. The Morro Bay region has been previously identified as an area commonly influenced by summer fogs and a refugia for disjunct/relict lichen taxa (Riefner 1990), including narrow endemics such as the fruticose species *Sulcaria isidiifera* Brodo (Brodo 1986). Phylogenetic implications of the anatomically-ecologically similar group of saxicolous *Niebla* species related to *Niebla tuberculata* will be discussed in a forthcoming paper.

ACKNOWLEDGEMENTS

We would like to express our gratitude to Dr. Chicita Culberson and Anita Johnson for TLC analysis of *N. tuberculata*. Mrs. C. C. Bratt provided critical pre-submission review. We also thank the curators of CAS, DH, LAM, and SBM for the loan of specimens, Mr. David Williams for photography, and Mr. Richard Ray, Chief Ranger, for collecting permits. The support of the National Science Foundation grant BSR 9201111 is also acknowledged for making this collaboration possible.

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MYCOTAXON

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NOTES ON CONIDIAL FUNGI. II. A NEW SPECIES OF *ENDOPHRAGMIELLA*

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ABSTRACT

A new species of the genus *Endophragmiella* Sutton, *E. occidentalis* found on fallen leaves of *Theobroma cacao* from Cuba is described and illustrated. It is characterized by unicellular, obovate and dark brown conidia. The differences between *E. occidentalis* and closely related species are briefly commented upon.

RESUMEN

Se describe e ilustra el nuevo hifomiceto *Endophragmiella occidentalis* hallado en hojas caídas de *Theobroma cacao* en Cuba. Dicha especie se caracteriza por sus conidios unicelulares, obovoides y pardos oscuros. Se comentan las diferencias existentes entre *E. occidentalis* y otras especies cercanas.

TAXONOMIC PART

Endophragmiella occidentalis *Castañeda, Guarro et Cano anam. sp. nov.* (Figs. 1,2)

Ad fungus conidiales, hyphomycetes, pertinens. ***Coloniae*** *effusae, pilosae, amphigenae, atro-brunneae. Mycelium partim superficiale et partim in substrato immersum, ex hyphis septatis, breve ramosis, laevibus, atrobrunneis, 2-3 μm diam. compositum.* ***Conidiophora*** *conspicua, mononemata, solitaria vel aggregata, 2-5 septata, cylindrica, non-ramosa, erecta, recta, laevia, atrobrunnea ad basim, pallide brunnea ad apicem, usque 320 μm alta et 4-8.5 μm crassa ad basim.* ***Cellulae conidiogenae*** *monoblasticae, terminales, percurrentes, prolificans, extendentes, in conidiophoris incorporatae, dilute brunneae,* ***Conidia*** *obovata, aseptata, acrogena, (plerumque acropleurogena adhesa visa deinde conidium secessio rhexolytica) solitaria, sicca, laevia, raro verrucosa, atro-brunnea, 10-12 x 9-11 μm, cum filo cicatrico, truncato,*

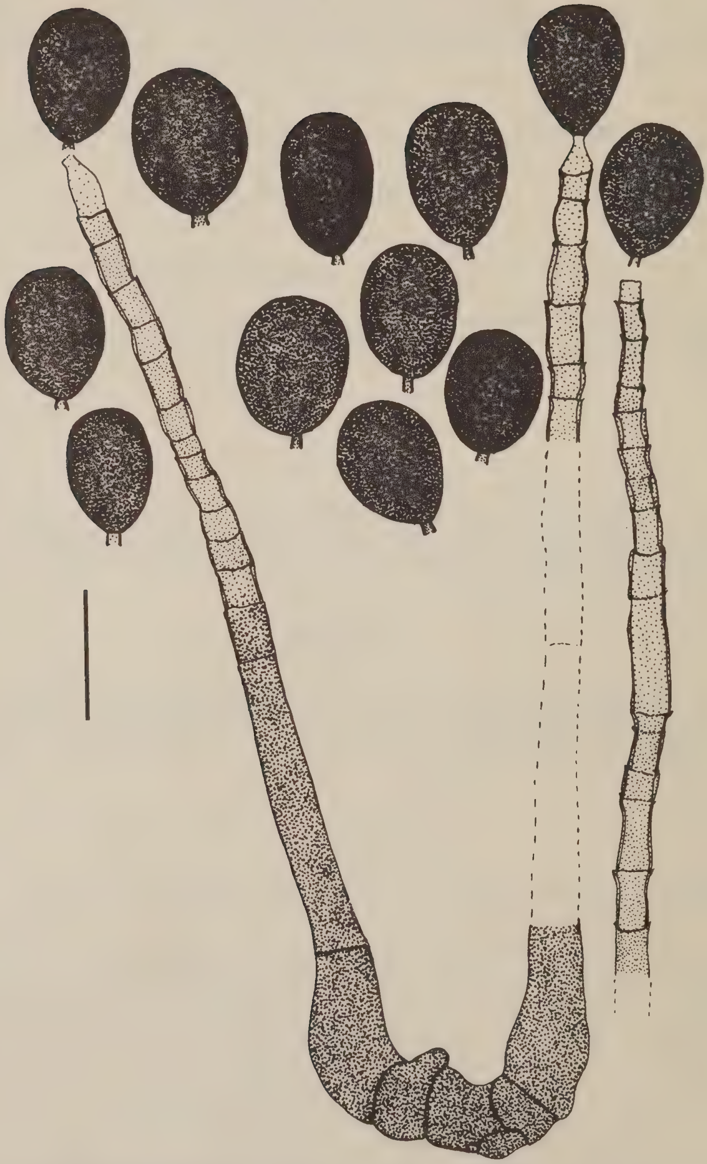

Fig. 1.- *Endophragmiella occidentalis* (INIFAT C94/18). Conidiophores and conidiogenous cells (bar = 10 μm).

subhyalino, conspicuo, 1-2 µm largo (reliquiis cellularum conidiogenarum) ad base praedita.

Teleomorphosis ignota.

Conidial fungi, hyphomycetes. **Colonies** spreading, velvety, amphigenous, dark-brown. Mycelium superficial and immersed. Hyphae septate, branched, smooth-walled, dark-browm, 2-3 µm diam. **Conidophores** differentiated, mononematous, solitary or arising in groups, 2-5 septate, cylindrical, unbranched, upright, straight, smooth, dark-brown at the base and pale-brown at the apex, up to 320 µm tall and 4-8.5 µm wide at the base. **Conidiogenous cells** monoblastic, terminal, with several percurrent proliferations, integrated, pale brown. **Conidia** obovate, 0-septate, acrogenous, frequently sympodially adhered after rhexolytic secession, solitary, dry, smooth-walled, rarely verrucose, dark-brown, 10-12 x 9-11 µm, with a conspicuous, subhyaline, truncate, 1-2 µm long, scar filament (remains of conidiogenous cell) at the base.

Teleomorph unknown

Habitat: On decaying leaves of *Theobroma cacao*, Santiago de las Vegas, Cuba. Holotype: INIFAT, C 94/18, R.F. Castañeda. 5-II-1994. Isotype deposited in MUCL Culture Collection (Louvain-la-Neuve, Belgium).

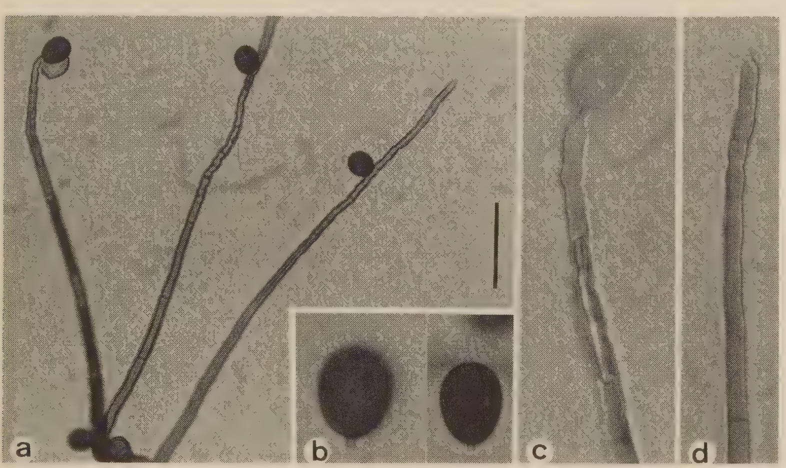

Fig. 2.- *Endophragmiella occidentalis* (INIFAT C94/18). (**a**, bar = 25 µm; **b**,**c**,**d**, bar = = 10 µm).

DISCUSSION

The genus *Endophragmiella* Sutton has been delimited by Hughes (1979) and enlarged by Kirk (1985) and Holubová-Jechová (1986); it is characterized by the rhexolytic conidium secession and several percurrent proliferations.

Among published species of *Endophragmiella* only *E. leonensis* (M.B. Ellis) Hughes 1979, *E. albiziae* (M.B. Ellis) Hughes (1979), *E. aseptata* Holubová-Jechová (1986) and *E. dingleyae* Hughes (1978) are slightly similar to *E. occidentalis* because their conidia are 0-septate. However, the conidia of *E. dingleyae* have roughened walls; in *E. albiziae* they are spherical or subspherical, pale or subhyaline and measure 16-22 μm diam. *E. leonensis* has spherical, dark-brown, 10-12 μm diam, conidia and *E. aseptata* has elliptical, brown, 7-11 x 6-7.5 μm, conidia.

ACKNOWLEDMENTS

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A NEW SPECIES OF THE GENUS GASTROBOLETUS FROM NEW CALEDONIA

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ABSTRACT

Gastroboletus doii Zang, from New Caledonia is described as a new taxon and the affinity of this species is discussed. A comparative examination of *G. boedijnii* Lohw. and *G. turbinatus* (Snell) Smith & Singer has confirmed their status as distinct taxa. The type specimen of *G. doii* is deposited in the mycological herbarium, National Science Museum, Tokyo, Japan (TNS).

Key Words: *Gastroboletus doii* Zang.

汉文摘要： 在南太平洋的新客里多尼亚岛，由日本菌物学家土居祥兑教授所采撷菌物标本中，其中经鉴定发现腹牛肝菌属之一新种， 命名为土居腹牛肝菌 Gastroboletus doii Zang. 原模式标本存日本东京国立自然科学博物馆中.　　撰稿人：臧 穆.

New Caledonia, located in the southwest Pacific Ocean, ca 1200 km east of Australia, is 399.11 km long, 49.89 km wide, and has an area of 7374 square miles. The climate is basically subtropical, with mean monthly temperatures ranging from about 17°C to 32°C. Rainfall is highest from December to March. The highest peak is Mt. Panié at 1650 m alt. Dr. Yoshimichi Doi explored the mycoflora and collected on the island in Feb. 1992, particularly on Mt. Mou, 1100 m. alt. in South Provence where he collected the new taxon *Gastroboletus doii* Zang. The genus Gastroboletus is briefly described below.

Gastroboletus Lohwag, Beih. Bot. Centralbl. 42: 273. 1926.

The basidiocarp resembles that of the genus *Boletus*; it is different in that the spores are not forcibly discharged and the tubes are not oriented positively geotropically. Hymenophore (gleba) tubular, usually exposed at least in places around the stipe-columella; columella terete and merely a continuation of the stipe (A. H. Smith & R. Singer, 1959). The young fruiting body has a universal veil tissue, which is an outer sheath completely surrounding the immature button fruiting body. During expansion it is ruptured and its remnants are left on the base of the stalk and on the pileus, particularly on the margin. The type species of the genus, *G. boedijnii* Lohwag, was based on Chinese material of the Handel-Mazzetti collection from the village Nguluko (雪 松 村) 2900 m, Yulung Mts., Lidjiang (Lijiang), Yunnan, early October, 1916 (12951), (H. Lohwag, 1926; R. Singer, 1981; E. Horak, 1987). It was illustrated and described again by H. Lohwag (Lohwag, 1937). Between 1981 and 1983, it was also collected from Zhongdian (中 甸), Deqin (德 钦), Yunnan and Xiangcheng (乡城), Western Sichuan (Zang, 1983). Several additional North American and African species have been published (A. H. Smith & R. Singer, 1959; R. Singer, 1986). With his report, the range of *Gastroboletus* is extended to New Caledonia. This species is also the first known reduced member of the family Gastroboletaceae.

Gastroboletus doii Zang, sp. nov. (Fig. 1-5)

Receptaculum 3-5 cm magnum, pileo et stipite constructum. Pileus 3-5.5 (6) cm latus, convexus demum plano-compressus, carnosulus, ad marginem etenuatus, siccus tomentosus, brunneo-flavus, cervinus, alutaceus, sordide ochraceus. Superficies pilei hyphis 6-14 μm crassis, intertextis. Contextus 1.5-2 cm crassus, flavus, caerulescens. Margo partim cum basi incrassata conjunctus. Stratum hymeniale tubulosum. Tubuli 3-7 mm longi, pori 0.2-0.5 mm diametro; angulares vel irregulares, 10-14 per cm. Stipes 3-4.5 (4) cm longus, 0.5-1 cm crassus, clavatus vel subaequalis, apice reticulatus, basi primo bulbosus, excavatus, demum volvo conservatus. Basidia 25-30 X 12-18 um. 4-sporigera. Basidiosporae 20-26 (28.6) X 9-10.4 (11) um, ellipsoideae, angustoellipsoideae, leves, hyalino-aurantiacae. In solutione Melzeri brunneo-aurantiacae. Pleurocystidia 52-65 X 10-16 μm, clavata. Cheilocystidia 65-75 X 13-19 μm, fusiformia. Fabulatae adsunt.

Habitat: In sylvis

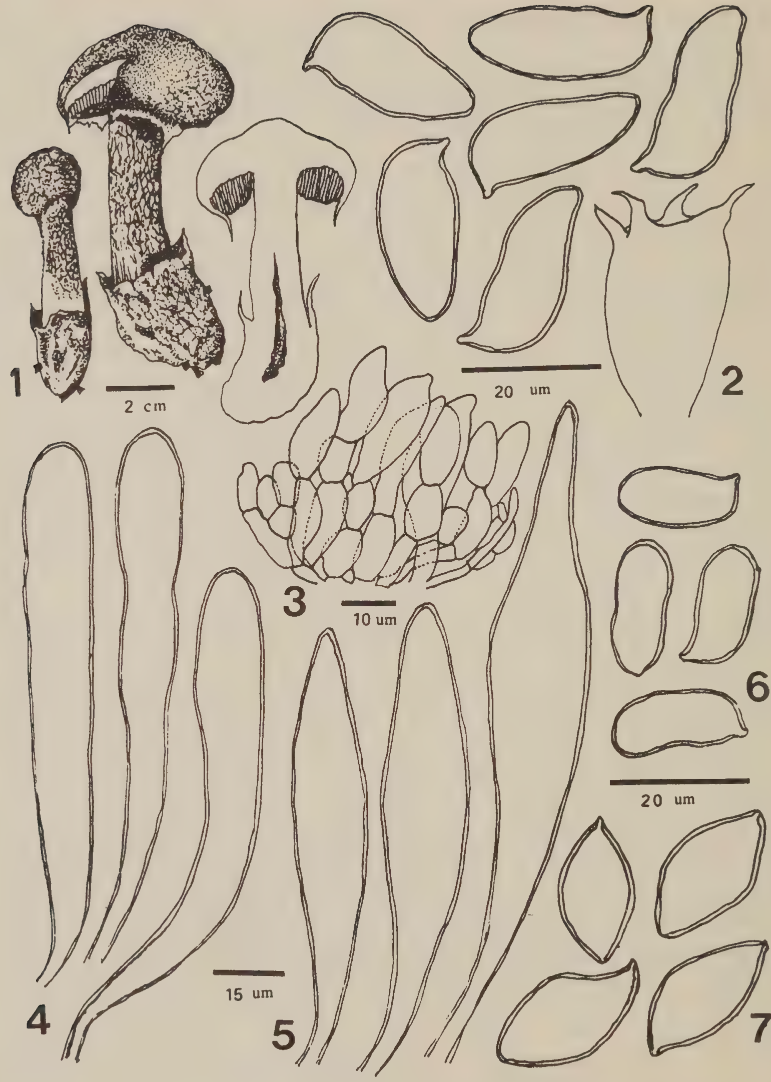
New Caledonia: Mt. Mou, 1100 m alt. South Province, 21 Feb. 1992, Y.

Doi F-171953 Typus ! (TNS).

Etymology: Gastro = gastric; boletus = the genus *Boletus*; doii = in honor of mycologist Dr. Yoshimichi Doi（土居祥兑教授）

Receptacle 3-5 cm broad, convex to irregular round in outline. Peridium dry and pruinose to subtomentose, pale dull brown to ochre, the bruised places finally dark brown. Pileus 3-5.5 (6) cm broad, convex at first becoming broadly convex to plano-convex at maturity, margin typically appendiculate with veil fragments, surface dry, never truly viscid but at times tacky when young, smooth to uneven, rarely somewhat pitted, subtomentose or in age with a felted fibrous surface, occasionally appearing glabrous with age, brownish yellow, cervine, pale brown, dingy ochre-yellow. Pileus cuticle a trichoderma of compactly and closely interwoven erect hyphae, 6-14 μm in diameter; terminal hyphae with 3-5 cells arranged in a chain, cells of the hyphae varying from oblong-elliptical, clavate to globose in shape, many so closely packed to produce an epithelium, end cells 16-24 X 52-60 μm, globose, pyriform, obclavate. Context soft, 1.2-2 cm thick, pallid-yellow, quickly turning blue when cut. Hymenium bright yellow to golden yellow. Tubes ventricose, 3-7 mm deep, adnate but becoming free or nearly so, yellow, quickly turning blue when touched. Pores angular or irregular angular, 0.3-0.5 (5) cm long, 0.5-1 cm thick, clavate to subequal, tapered upward, gradually enlarged downward, hollow in lower portion at least in age, yellowish to sordid brownish, finely reticulate above and coarser below, when dried pale buff with reticulate pallid. Universal veil membranous, pale dull brown, friable, forming a distinct sac-like volva at base of stipe and leaving remnants on pileus margin. Basidia 25-30 X 12-18 μm, 4-spored. Basidiospores 20-26 (28.6) X 9.10.4 (11) μm, hyaline yellow, golden-yellow, ellipsoid, narrow-ellipsoid, more or less cylindric in face view, narrowly inequilateral in profile view, smooth, hyaline sheath distinct, golden brown in Melzer's solution. Pleurocystidia 52-65 X 10-16 μm, clavate. Cheilocystidia 65-75 X 13-19 μm, fusiform. Clamp connections absent.

This species is closest in morphology to *Gastroboletus boedijinii* Lohw. (Fig. 6). The young fruiting body of *G. doii* like *G. boedijinii* has universal veil tissue which is an outer sheath completely surrounding the immature fruiting body. During expansion it is ruptured and its remnants are left on the base of the stalk and on the pileus, particularly on the


1
2 cm
20 um
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3
10 um
6
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4
15 um
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7

Figs. 1 - 7. *Gastroboletus* species. 1. *G. doii*, basidiocarps in profile and in section. 2. *G. doii*, basidiospores and basidia. 3. *G. doii*, pileus cutis. 4. *G. doii*, pleurocystidia. 5. *G. doii*, cheilocystidida. 6. *G. boedijnii*, basidiospores. 7. *G. turbinatus*, basidiospores.

margin. But *G. doii* differs significantly in several ways. Notably, the pileus surface is dry and pruinose to subtomentose, the stipe is finely reticulate, and the basidiospores are 20-26 (28.6) X 9-10.4 (11) μm while in *G. boedijnii* they are only 12-14 X 5 μm. Among the described species of the genus *Gastroboletus*, *G. doii* appears to be close to *G. turbinatus* (Snell) Smith et Singer, but in the latter, the basidiospores are slightly ovate, ellipsoid to oblong face view, somewhat inequilateral in profile, measuring 9.5-18.9 (20) X 5.5-9.5 μm (Fig. 7), and the stipe becomes finally glabrescent, without reticulation. A bolete with a volva is uncommon. The genus *Volvoboletus* was described by P. Hennings (S. Killermann, 1928), based on *Boletus volvatus* Pers. = *Volvoboletus volvatus* (Pers.) Henn. but a type specimen is not extant. Singer (1986) has reviewed this genus. The genus *Paragyrodon* (Singer) Singer has a volva-like annulus which is viscid, white and membranous, but it does not develop an obvious volva at the base of the stipe and thus is different from *G. doii*.

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It is a pleasure to acknowledge my indebtedness to Professor Richard P. Korf, (Cornell University) for his encouragement and helpful suggestions throughout my research, Prof. Donald H. Pfister (Farlow Herbarium, Harvard University) for review, and Dr. Yoshimichi Doi (TNS for arranging loans of specimens.

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MYCOTAXON

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AUTHORS, REVIEWERS, AND EDITORS OF ARTICLES PROPOSING NEW NAMES: A FEW GUIDELINES

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> "A little neglect may breed mischief: for want of a nail the shoe was lost; for want of a shoe the horse was lost; ...."
> Benjamin Franklin
> MAXIM prefaced to *Poor Richard's Almanac* 1757

ABSTRACT

Many new names of fungi recently proposed have been shown by listings in the *Index of Fungi* to be not validly published under the *International Code of Botanical Nomenclature.* Unfortunately many of these errors were committed by highly respected mycologists, and published in thoroughly respectable journals. Fourteen new generic names and 127 other new names not validly published are analyzed. The reasons for rejection of these names are primarily inattention to the details for valid publication spelled out in that *Code.* Though the ultimate responsibility for publishing correct names lies with authors, clearly reviewers and editors are shirking their duties to advise authors of such errors prior to publication. A few simple guidelines for authors, reviewers, and editors are offered.

KEYWORDS: Nomenclature, valid publication, new taxa, new names, new combinations, authors, reviewers, editors

THE PROBLEMS

In my perusal of the most recent semi-annual issue of the *Index of Fungi* (Anon., 1994) I was once again struck by the large number of names being proposed that are either incorrect or, far worse, not validly published. That publication performs an exceptionally important service, not only in recording new taxa as well as new names and new combinations for old taxa that are published, some in obscure journals or books, but also in pointing out such errors as the editors of that *Index* detect, and, recently, in citing the specific Articles of the *International Code of Botanical Nomenclature* (ICBN) (Greuter, & al. 1988) that render such names "not validly published." In this article I have used the Article numbers as they appear in the 1988 *Code*. Readers should be aware that if they consult the newly published *Code* (Greuter, & al. 1994) the Articles have been re-numbered following Art. 50.

One of the most common errors made is that **the wrong Latin termination** is given, typically where a species epithet fails to agree in gender with the generic name. This merely renders the name incorrect, and a correction can be made (by anyone). From the above-cited issue of the *Index*, **thirty** of the new taxa or new combinations had such less than fatal flaws, and the corrections and indication of the original misspellings were made there.

Fatal flaws, however, result in names *not being validly published*. For new taxa, the ICBN now has many specific, detailed requirements which must be met before valid publication can occur. Many of these requirements only apply to names proposed after a specific date, while others are retroactive. Almost everyone, for example, realizes that a new taxon of the rank of family or below[1] is not validly published after 1.I.1935[2] without a Latin diagnosis or description. All old and many more recent requirements apply to new taxa being proposed now, the subject of this note. A particularly plaguing problem is that when the type species of a new genus does not meet *all* those requirements, the new generic name *itself* becomes "not validly published." One tiny misstep may doom a new generic name and all its species and new combinations. I noted **fourteen generic names in that issue of the *Index* that fall** because of such fatal flaws, and briefly annotate them here, as a series of case studies. All fourteen generic names fail because their holotypes (i.e., type species) are not validly published, for a variety of reasons. In some cases not only the generic name and its holotype (HT) fall, but also all additional species, paratypes (PT), fall as well, since the inverse also applies: a species cannot be validly published if the generic name to which it is assigned is not validly published.

Case I: No indication of the herbarium where the holotype of the type species was deposited (Art. 37.5)

Blastophragma Subram., *Crypt. Mycol.* **14:** 43. 1993. [*B. subulatum* Subram. (HT), *B. rostratum* Subram. (PT)]

Dwibeewja Subram., *Crypt. Mycol.* **13:** 117. 1992. [*D. sundara* Subram. (HT)]

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[1] except of fossils

[2] except for algae, 1.I.1958

Javonarxia Subram., *Crypt. Mycol.* **13:** 122. 1992. [*J. triseptata* Subram. (HT), *J. quadriseptata* Subram. (PT)]
Nusia Subram., *Crypt. Mycol.* **14:** 111. 1993. [*N. scheeleae* Subram. (HT), *N. collariata* Subram. (PT)]
Phialocorona Subram., *Crypt. Mycol.* **14:** 48. 1993. [*P. pleomorpha* Subram. (HT)]
Tretocephala Subram., *Crypt. Mycol.* **13:** 67. 1992. [*T. decidua* Subram. (HT)]
Veramyces[3] Subram., *Czech Mycol.* **47:** 4. 1993. [*V. elegans* Subram. (HT)]

Case II: Inadmissible living types[4] of type species designated (Art. 9.5) as holotype (Art. 37.1)

Anekabeeja Udaiyan & V. S. Hosag., *J. Econ. Taxon. Bot.* **15:** 649. *1991* (1992). [*A. lignicola* Udaiyan & V. S. Hosag. (HT)]
Mukhakesa Udaiyan & V. S. Hosag., *J. Econ. Taxon. Bot.* **15:** 651. *1991* (1992). [*M. lignicola* Udaiyan & V. S. Hosag. (HT)]
Neelakesa Udaiyan & V. S. Hosag., *J. Econ. Taxon. Bot.* **15:** 652. *1991* (1992). [*N. lignicola* Udaiyan & V. S. Hosag. (HT)]
Phaeodactylella Udaiyan, *J. Econ. Taxon. Bot.* **15:** 631. *1991* (1992). [*P. lignicola* Udaiyan (HT)]
Phialogangliospora Udaiyan & V. S. Hosag., *J. Econ. Taxon. Bot.* **15:** 654. *1991* (1992). [*P. lignicola* Udaiyan & Hosag. (HT)]
Phialoselanospora Udaiyan, *J. Econ. Taxon. Bot.* **15:** 627. *1991* (1992). [*P. elegans* Udaiyan (HT)]

Case III: Holotype collection of type species cited as being deposited in two herbaria (Art. 9.1)

Sivanesania W. H. Hsei & C. Y. Chen bis, *Mycological Research* 98: 44. 1994. [*S. rubi* W. H. Hsei & C. Y. Chen bis (HT)]

In addition to the 17 species names involved with these 14 invalid generic names, there were at least **110 other new taxa or new combinations or new names rejected** in that one issue of the *Index of Fungi*. I discuss these briefly here:

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[3] *Veramyces* and its holotype cannot simply be validated by providing the missing data,since a validly published homonym, *Veramyces* Matsush., was published in 1993 (Anon., 1994, p. 455).
[4] Under the new, Tokyo ICBN deposit of metabolically inactive (*e.g.*, lyophilized) material is permitted.

New taxa proposed but not validly published include the following:

- **Seventeen** names were indicated by their authors to be **provisional names** (indicated by such notations as *nom. prov.*, ined., *pro tem.*, etc.). Publication of such names merely clutters the literature **(Art. 34.1**(b)**).**
- **Eleven** names lack the required **Latin** diagnosis or description **(Art. 36).**
- **Ten** names involved **incorrect designation of the type,** such as failure to designate a holotype or to use the word *typus* or *holotypus* or its abbreviation or equivalent in a modern language **(Art. 37.4)** or failure to cite the herbarium in which the type is permanently deposited **(Art. 37.5),** or the holotype collection was divided and both parts were cited as type **(Art. 9.1),** or where a living culture was cited as the type **(Art. 9.5).**
- **Two** instances involve names deemed **superfluous** because among the included elements was the type of a previously published valid name that should have been adopted **(Art. 63).**

Later homonyms[5] (duplicate names based on different types) caused publication of five illegitimate names **(Art. 64):**

- **Three new taxa** had names which were spelled exactly the same as previously published names based on a different type.
- **Two new combinations** resulted in names which were exactly the same as names published earlier based on a different type.

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[5] A problem I do not comment on in this note concerns publication of homonyms, *i.e.*, names whose spelling exactly duplicate names published earlier with *different* types. In nearly all such cases the fault lies with the author not knowing *all* of the available literature. With literature so widely scattered this seems an almost insurmountable problem, which now can often be caught by, *e.g.*, the editors of the *Index of Fungi*, where large databases are on hand. When a system of *registration* of new names is implemented and the provision already in the Tokyo Code is activated, most such errors could possibly be avoided. Though transfers of homonyms are normally prohibited, such "transfers" are acceptable as new taxa with a new author citation inferred (see Art. 72, Note 1, and its Examples 2 and 3). There seems little excuse for the publication today of homonyms of names already recorded in, *e.g.*, Saccardo's (1882-1966) *Sylloge Fungorum* or in published issues of the *Index of Fungi*, inclusive of *Petrak's Lists*, two series hopefully available to all serious mycological taxonomists.

New combinations and new names or new ranks for old taxa fall into a slightly different category, for these of course do not require a Latin description or diagnosis, yet they must meet certain criteria of the ICBN. These errors appear in that issue of the *Index:*

- **Ten** names that are **superfluous combinations** were noted, where the same combination based on the same type had been made earlier (in some instances even by the same author).
- An astonishing **fifty-five** names are invalid because of **failure to cite the basionym** of the name correctly. (In all fairness, it should noted that 39 of these are attributable to one publication.) **Article 33** of the *Code* thus appears to be the major stumbling block producing invalid names. Typical causes are failure to cite the basionym at all, or if cited missing part of that citation, such as author's name, exact place and date of publication including page or pages on which the basionym appeared (or, in some cases, providing too many pages, *i.e.,* listing the full pagination of the article rather than just the page or pages on which the basionym was validly published; see footnote 1 to Art. 33).

THE SOLUTIONS

Whose fault are such errors? Clearly the ultimate responsibility lies with the authors of such names, who supposedly are taxonomists *cognizant* of the rules of the ICBN. Obviously many of our foremost taxonomists are *not* meticulous in nomenclatural matters. It seems clear to me that since these errors continue to be published, our journal and book review processes can not be functioning correctly. Among the duties of a reviewer of a taxonomic paper in which nomenclatural novelties are proposed is, prior to accepting it, to check whether the author(s) complied with the provisions of the ICBN. *If a reviewer lacks sufficient expertise, that person is surely the wrong reviewer,* and the choice of that reviewer by the editor (or, in the case of *Mycotaxon* and a few other journals, by the author) was wrong. If an editor is unaware of or inexperienced with the rules, and relies only on reviewers to flag nomenclatural mistakes, perhaps that journal ought to consider ceasing publication of nomenclatural novelties (as, indeed, some journals have wisely decided to do).

To help authors, reviewers, and editors in avoiding such errors, and to save the space used by correctly republishing invalid names in later papers once the errors have been detected, I offer the following brief guidelines. These cover the most common problems. Editors should feel free to copy these and send them along with manuscripts when submitting papers proposing new names to reviewers. Copyright is hereby relinquished. No acknowledgement of the source is necessary.

ACKNOWLEDGEMENTS

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(The Guidelines are printed on the next page to facilitate their reproduction by xerography)

Guidelines for Use by Authors, Reviewers, and Editors

ANY "NO" ANSWER INDICATES A PROBABLE ERROR

For new taxa at the rank of species or lower ***(types are usually specimens):***

1) Is a Latin diagnosis or description provided?
2) Is the type *specimen* fully cited with the use of the words typus or holotypus, and clearly defined (*e.g.*, by collection number or date), and the place of deposit of that specimen clearly stated?
3) If more than one specimen is cited, is it unambiguous as to which specimen is the holotype, which are isotypes, which are paratypes?
4) If the type specimen has been divided, has only one part been designated the holotype, and the other part(s) designated as isotype(s)?
5) Is the rank of the new taxon clearly indicated?
6) Do the genders of the generic name and of the proposed specific or infraspecific epithet agree?

For new taxa at a rank above species, up to and including family ***(types are names):***

1) Is a Latin diagnosis or description provided?
2) Is the type of the name validly published?
3) Is the rank of the new taxon clearly indicated?
4) Do the genders of the generic name (if involved) and of any new infrageneric taxon agree?

For new combinations of—or for new names or new ranks for—previously described taxa ***(types are names or specimens):***

1) Was the earlier name validly published? If not, what is proposed is a *new taxon* (see above), not a new combination, nor a new name, nor a new rank.
2) Is the basionym clearly indicated and bibliographic reference fully cited, including its author(s), page or pages where proposed, and date of the original publication?
3) Is the rank clearly indicated?
4) Is there agreement in gender between the generic name (if involved) and its epithet (if there is one)?

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A NEW SPECIES AND A NEW VARIETY OF THE LICHEN GENUS GYALIDEA FROM WESTERN EUROPE

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ABSTRACT: Descriptions are provided for two new taxa of Gyalidea: *Gyalidea hyalinescens* var. *pauciseptata* var. nov., a saxicolous lichen from The Netherlands; and *Gyalidea minuta* sp. nov., a corticolous lichen from southern Portugal.

INTRODUCTION

Previously only one location was known for *Gyalidea* in The Netherlands (Brand et al. 1988). It concerns *G. psammoica,* found ten years ago on the Wadden Sea Island Texel, were it was growing terricolous in stable calcareous dunes. In the summer of 1993, during an excursion in the province Noord-Brabant (The Netherlands), the first author made several lichen collections from an old brick wall of the monumental tower at Cuijk, including a *Gyalidea,* which appeared to be unidentifiable with the recent key to the 24 known species (Vězda & Poelt 1991). It was sent to the second author and after his study and a comparison with the type-collection of *G. hyalinescens,* it became clear that it represents a new variety. *G. hyalinescens* s.s. is known in Europe from N. Scotland in the north to the French Pyrenees in the south, the Azores in the west and Germany in the east (Purvis et al. 1992). It occurs on basalt or siliceous rock in damp habitats. The spores of this species are 3-septate.

The spores of *G. hyalinescens* var. *mexicana* (B. de Lesd.) Vězda, known from Kenya, Ecuador and Mexico are submuriform and much longer, 30-35 μm.

In a study of lichens from Portugal, mainly from the province Algarve, in the summer of 1993, the first author collected an undescribed species of the genus *Gyalidea*. This very inconspicuous lichen was collected from a trunk of *Alnus glutinosa* in a very shaded situation, with only a few associated species. It seems to be the first record of the genus *Gyalidea* for Portugal, since the synopsis by Vězda & Poelt (1991), in which the known distribution for the genus is given, includes no records from that country.

Gyalidea hyalinescens (Nyl.) Vězda var. **pauciseptata** v.d.Boom var. nov.

Thallus viridicinereus, parvus, laevis, effusus, tenuissimus. Apothecia 0.15-0.3 mm diam., cinereofusca, sessilia, dispersa vel agglomerata, concava, basi constricta; excipulum olivaceofuscum; hymenium 50-60 μm crassum; epithecium hyalinum vel pallide olivaceofuscum; hypothecium hyalinum; paraphyses c. 1.5 μm crassae, in apicibus paulo inflatae: asci octospori, 45-55 x 10-15 μm; ascosporae 13-15.5 x 6-7 μm, elongato-ellipsoideae, submuriformes, septis transversalibus 3(-4), septis longitudinalibus 0-2.

Icon.: Fig.1 nostra.

Typus: The Netherlands, prov. Noord-Brabant, Cuijk, old sheltered wall, grid square 46-22-55, 4 September 1993, leg. P.v.d.Boom 14995 (B-holotypus; hb. v.d. Boom, hb. Vězda-isotypus).

Thallus greenish grey, in small patches, smooth and effuse, very thin. *Apothecia* 0.15-0.3 mm in diam., greyish brown, sessile and scattered to clustered, concave, constricted at base. *Excipulum* olive-greyish brown, well developed. *Hymenium* 50-60 μm tall. *Epithecium* hyaline to pale olive-brown. *Hypothecium* hyaline. *Paraphyses* unbranched, c. 1.5 μm in diam. somewhat inflated at apices. *Asci* 8-spored, 45-55 x

10-15 µm. *Ascospores* 13-15.5 x 6-7 µm, elongate-ellipsoid, submuriform, with 3-4 transverse septa and 0-2 longitudinal septa (fig. 1). *Conidiomata* not observed.

Ecology: *Gyalidea hyalinescens* var. *pauciseptata* is known from only one collection, on sheltered, strongly sloping, shaded volcanic tuff, associated with *Lepraria lobificans, Leproloma vouauxii, Porpidia soredizodes, Scoliciosporum umbrinum, Tortula muralis, Trapelia coarctata* and *Verrucaria viridula.* Lichens from the same wall include *Acarospora smaragdula, Caloplaca citrina, C. flavescens, C. ruderum, C. saxicola, Diploicia canescens, Lecania cuprea, L. rabenhorstii, Lecanora albescens, L. campestris, L. dispersa, Lecidella scabra, Physcia adscendens, Psilolechia leprosa, T. obtegens, T. placodioides, Verrucaria glaucina, V. macrostoma, V. muralis* and *V. nigrescens.*
The wall of the tower is situated at the entrance of a churchyard in which *Trapeliopsis gelatinosa* was found abundantly and well developed on soil. *Bacidia saxenii* was also found here, scattered in small amounts among this species. The former is known from a few localities in The Netherlands, while the latter is a first record for The Netherlands. The long brick wall along the churchyard yielded many lichens such as *Bacidia egenula, Cladonia humilis, Lepraria lesdainii, Tephromela atra* and *Vezdaea leprosa.* The latter was growing abundantly on E exposed sloping brick and overgrowing mosses.

Gyalidea minuta v.d.Boom & Vězda sp. nov.

Thallus epiphloeodes vel pro parte endophloeodes, crustaceus, ob substratum rugosum interruptus, cinereo-virens, prothallus nullus. Apothecia gyalectoidea, sessilia, hyalina, madefacta perlucida, 0.15-0.2 mm lata, 0.1 mm alta. Excipulum hypotheciumque hyalinum. Hymenium 50-55 µm altum, incoloratum. Paraphyses simplices, apicibus haut incrassatis, tubulis 1.5 µm crassis, indistincte septatae. Asci cylindrico-clavati, membranis in apicibus incrassatis, 8-spori. Ascosporae ellipsoideae, uno apice vulgo magis attenuatae, muralidivisae (septis transversalibus 3 - 5, longitudinalibus 0 - 1), ad septa constrictae, 12 - 17 µm longae, 5 - 9 µm crassae.
Habitu *Gyalideae cylindricae* Etayo et Vězda ined. subsimilis, sed

ascosporis muraliformibus ab ea diversa (ascosporae in *G. cylindrica* tantum 5-7-transverse septatae), 20-30 x 6-7 µm.

Icon.: Fig.2 nostra.

Typus: Portugal, Algarve, Serra de Monchique, road 267, to S. Marcos da Serra Alferce, 1.8 km of crossing to Monchique, small valley with *Juglans* and *Alnus glutinosa* trees in dry stream, alt. 500 m, on trunk of very shaded *A. glutinosa,* 28 July 1993, leg. P.v.d.Boom 14875 (hb. v.d.Boom-holotypus; B, hb. Vĕzda-isotypus).

Thallus epiphloeodal or partly endophloeodal, corticolous, scattered among substrate wrinkles, greyish green, without visible prothallus. *Apothecia* gyalectoid, sessile, hyaline, translucent when wet, 0.15-0.2 mm diam., 0.1 mm tall. *Excipulum* hyaline. *Hypothecium* hyaline. *Hymenium* 50-55 µm tall, colourless. *Paraphyses* simple, not broadening towards the tips, 1.5 µm in diam., indistinctly septate. *Asci* cylindrical-clavate, wall slightly thickened at apex, 8-spored. *Ascospores* ellipsoid, with rounded to attenuate ends, muriform, with 3-5 transverse septa, and a single longitudinal septum occasionally, constricted at septa, 12-17 x 5-9 µm.
In habitus subsimilar to *Gyalidea cylindrica* Etayo et Vĕzda ined., but ascospores muriform, 5-7 times transversely septate, 20-30 x 6-7 µm.

Ecology: *Gyalidea minuta* was found on a very shaded trunk of *Alnus glutinosa,* among shrubs, in a dry small stream, with only a few associated species: small thalli of *Candelariella reflexa, Micarea prasina* and *Phlyctis argena,* besides fragments of *Lepraria* sp. *Juglans* trees at a few meters distance and in a less shaded situation were covered with a luxuriant lichen community including *Acrocordia gemmata, Bacidia absistens, B. arceutina, B. caligans, Caloplaca citrina, Collema nigrescens, Flavoparmelia caperata, Gyalecta derivata, Hyperphyscia adglutinata, Leptogium teretiusculum, Opegrapha varia, Parmelina tiliacea, Parmotrema reticulatum, Pertusaria velata, Phaeophyscia chloantha, Phlyctis agelea, Physcia clementii, Strigula* cf. *taylorii* and *Xanthoria parietina.*

We are grateful to Dr Harrie Sipman for his critical review of the manuscript. Thanks to Dr B.J. Coppins for identification of *Bacidia saxenii* and *Trapeliopsis gelatinosa.*

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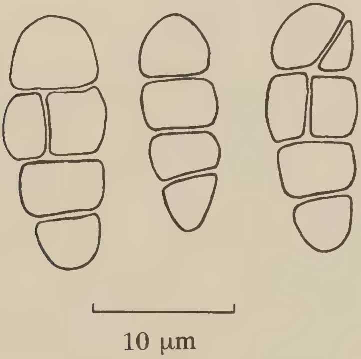
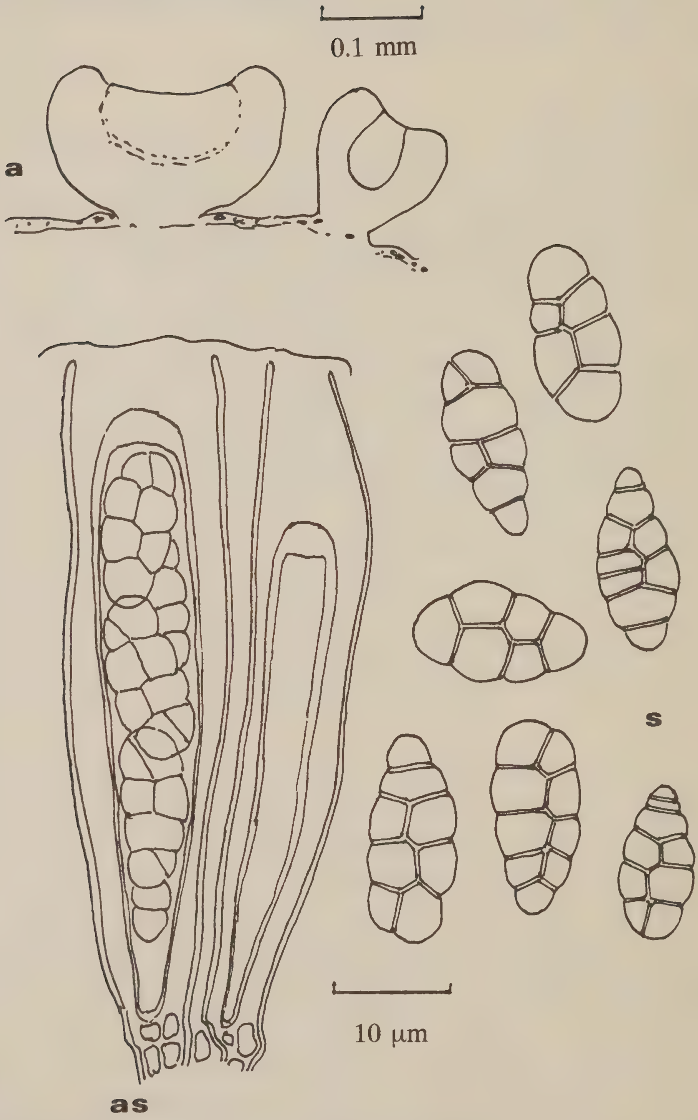


Fig. 1. *Gyalidea hyalinescens* var. *pauciseptata,* holotype: spores (v.d.Boom 14995).

Fig. 2. *Gyalidea minuta,* holotype: a, vertical section through two apothecia; as, asci with paraphyses; s, spores (v.d.Boom 14875).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NEW POLYPORES FROM THE *NOTHOFAGUS* FORESTS OF ARGENTINA

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SUMMARY

Three new polypores are described from the *Nothofagus* forests of Argentina. *Aurantioporus albidus* sp. nov. is associated with a white pocket rot in standing and fallen trees of *Nothofagus* species and has effused-reflexed, white, cartilagineous and thin fruitbodies composed of tightly packed and clamped generative hyphae, and has broadly ellipsoid spores with thickened walls. It is similar to *Aurantioporus pulcherrimus* (Rodw.) P.K. Buchanan & I. Hood, a species known from Australia, New Zealand and southern Brazil which grows on *Eucalyptus* and *Nothofagus*. Compatibility tests between *A. albidus* and *A. pulcherrimus* are presented, and the taxonomic circunscription of these species is discussed. *Fomitopsis minutispora* sp. nov. is associated with a brown rot in *Nothofagus alpina* and *N. dombeyi*. It is distinguished by effussed, effused-reflexed, triquetrous or ungulate, perennial fruitbodies and small pores and spores. *Postia carbophila* sp. nov. is a highly characteristic resupinate taxon growing on fallen stems of charred *Nothofagus* species. Cultural characters, nuclear behavior and mating systems are reported for *A. albidus*, *F. minutispora* and *P. carbophila*.

INTRODUCTION

During the last four years the author has regularly visited the *Nothofagus* forests of southern Argentina and collected wood-rotting fungi. Several publications regarding new records of Polyporaceae (Rajchenberg

1993, 1994) have shown a richer flora than previously known from that area (Wright & Deschamps 1972, 1975; Hjortstam & Ryvarden 1984; Rajchenberg 1989). It is likely that more species will be found as these forests are better surveyed. Wetter areas in the west, towards the border with Chile, seem a reservoir of yet undetected taxa. In this work three new polypores are described.

MATERIALS AND METHODS

Microscopic examination of fruitbodies was made from freehand sections mounted in 5% KOH aqueous phloxine, Melzer's reagent, cresyl-blue (CrB) and cotton-blue. Cultural features were studied and described according to Nobles (1965). The species' code describing 6 wk old cultures follow the system of Nobles (1965), with the modifications summarized by Nakasone (1990). The nuclear behavior (Boidin 1971) was studied according to the staining procedure described by Boidin (1958). Color names are in accordance with Munsell (1954). Herbarium abbreviations are according to Holmgren & Keuken (1974). Compatibility tests were performed by confronting selected single spore cultures representing mating types of one specimen with selected single spore cultures representing mating types of a different specimen (Hallenberg 1984). Di x mono compatibility tests were also performed, consisting of the confrontation of tissue/polysporic cultures of one specimen with monospore cultures of a different specimen (Hallenberg 1984). Duplicates of specimens and cultures are deposited at the author's laboratory. MR refers to collections and numbering made by the author. CIEFAP/cc refers to cultures kept at the author's laboratory.

TAXONOMY

Aurantioporus albidus Rajchenb. & Cwielong sp. nov.

Basidiocarpo annuo, effuso vel effuso-reflexo, cereo-albo, in vivo cartilagineo aquoso, in sicco duro; pori 1-2 per mm; pileo irregulariter strigoso vel scruposo; contexto translucido, albo. Systema hypharum monomiticum. Hyphae generativae fibulatae, 3-6-(7) μm latae, tenues vel crassitunicatae, laeves vel asperes. Basidiis claviformibus, 25-40 x 5-7 μm. Sporis late ellipsoideis, 5.5-6-7 x 4.5-5 μm, hyalinis, tenuis vel crassitunicatis. Ligno putrescente albo consociata. Species bipolaris astatocoenocytica. Holotypus BAFC 33339.

Fruitbody annual, effused (Fig. 1) or effused-reflexed, more rarely pileate and flabelliform, up to 9 x 3.5 x 0.5 cm, ceraceous white, easily detachable from the substrate. First forming small, effused, more or less circular patches, some patches may coalesce and elongate, and lack an hymenial surface. Later becoming reflexed and developing a poroid surface. Margin loosely felty. Consistency cartilaginous, translucent , watery. Pileus surface

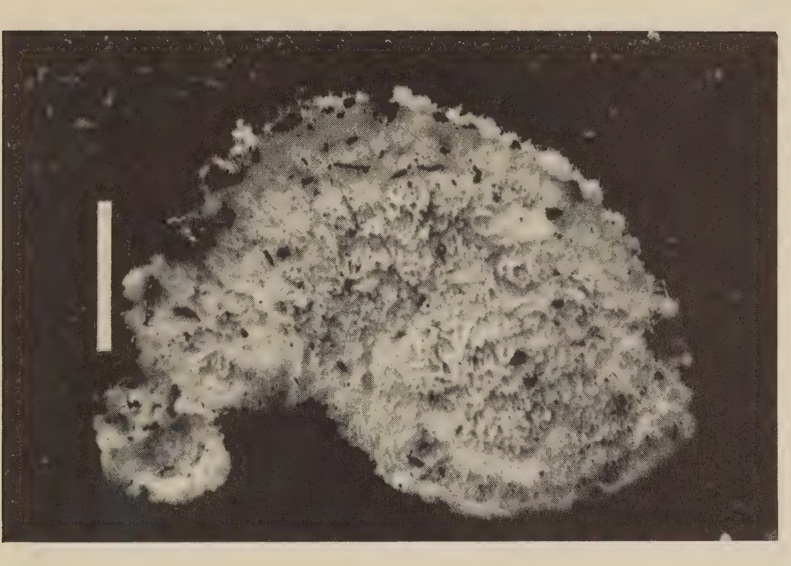


Fig. 1.- *Aurantioporus albidus*. Effused fruitbody, BAFC 33340. Bar= 1 cm.

irregularly strigose or scrupose towards the margin, the hairs formed by tightly packed bundles of hyphae; pubescent towards the substrate. Context cartilagineous, up to 0.3 cm thick. Tubes up to 0.2 cm long, rarely more. Hymenial surface white, with circular or irregular pores, 1-2 per mm, that may split and give a daedaloid aspect. Upon drying the fruitbody shrinks very much, becoming much thinner, to 3 mm thick, the consistency becoming bony, the hairs on the pileus dissapearing as they stick on the pileus surface that is then glabrous, and the dissepiments becoming fimbriate.

Hyphal system monomitic. Generative hyphae clamped, 3-6-(7) µm diam., branched, with thin, slightly or up to 1 µm thickened, hyaline walls. The hyphae in the context form tightly packed bundles, being very difficult to tear appart, their walls thickened to 2 µm and exhibiting a grainy, striate or rough aspect (Fig. 2). These hyphae seem to be immersed in a gelatinous matrix. Dissepiments with generative hyphae up to 5 µm diam., with hyaline, thin to slightly thickened walls, never sclerified (Fig. 3). Hairs on the pileus formed by sclerified generative hyphae.

Basidia claviform, tetrasporic, 25-40 x 5-7 µm (Fig. 4). Spores broadly ellipsoid, 5.5-6-7 x 4.5-5 µm, with up to 0.5 µm thick, hyaline, IKI, acyanophilous walls (Figs. 5-6).

Associated with a white pocket wood-rot on living and fallen *Nothofagus pumilio*, *N. antarctica* and *N. dombeyi*. It produces a characteristic heart-rot distinguished by white alveoli surrounded by darkened wood, the darkening perhaps produced by the delignification process.

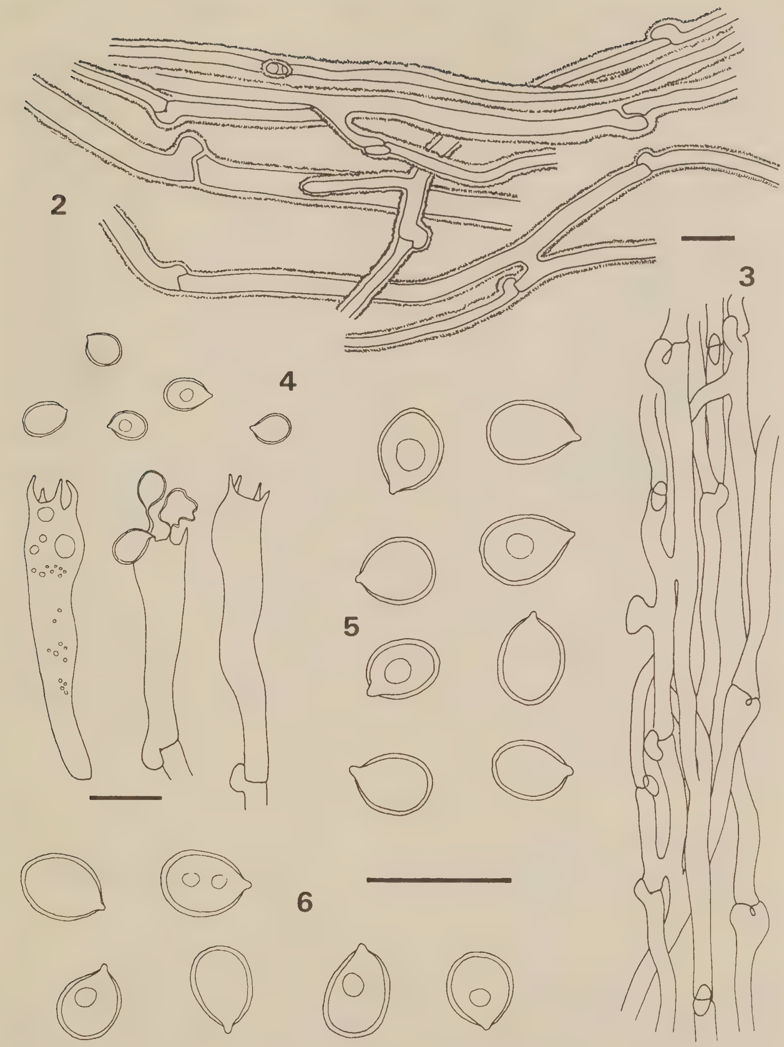
Material studied: ARGENTINA, Chubut, Río Senguer, El Triana, on a stump of a wind-felled *N. pumilio*, leg. MR and P. Cwielong, MR 10625, 2.Apr.92 (BAFC 33338). Futaleufú, Corcovado, on cut surface of *N. antarctica*, leg. P. Cwielong, MR 10747, Mar.93 (BAFC 33340). Ibid., Los Alerces National Park, Lago Futalaufquen, Cinco Saltos waterfalls, on cut stem of *N. dombeyi*, leg. S. Schmaltz, MR 10696, 18.Apr.92 (BAFC 33339, holotype). Río Negro, San Carlos de Bariloche, Bahía López circuit, path to Lago Escondido, on cut side of a fallen stem of *N. dombeyi*, leg. MR 10536, 22.Mar.92 (BAFC 33337). Neuquén, Lanín National Park, Lago Lácar, ca. Quechuquina timber mill, on fallen trunk of *N. dombeyi*, leg. MR 10659, 10.Apr.92 (BAFC 33335). Ibid., Lago Hermoso, N shore, on cut surface of a fallen trunk of *N. dombeyi*, leg. MR & P. Cwielong, MR 10677, 11.Apr.92 (BAFC 33336). CHILE, Osorno, Los Alerzales National Park, Cordillera Pelada, on cut side of a fallen tree, ca. 600 m a.s.l., leg. MR 4215, 18.Apr.88 (BAFC 33334).

Selection of the holotype: Collection BAFC 33339 (MR 10696) was chosen as holotype because it consists of a well developed, effused-reflexed fruitbody. The other collections consist of either smaller, strictly effused or only slightly reflexed fruitbodies. Thus, they were dismissed as holotypes, even though the material was larger than in the holotype. Also, there is a reference culture isolated from the holotype.

Cultural studies

Cultures studied (CIEFAP/cc): 120 (= BAFC 33338, from wood-rot), 111 (= BAFC 33339, from fruitbody), 118 (= BAFC 33338, from spore print), 117 (= BAFC 33338, from fruitbody), 26 (Argentina, Chubut, Futaleufú, Corcovado, Kakel Mts., from heart-rot in living *N. pumilio*, isolated by P. Cwielong, Nov.90), 175, 176 and 177 (Argentina, Chubut, Río Senguer, El Triana, from heart-rots in living *N. pumilio*, Apr.91, isolated by MR and J. del Vas, det. MR). Many cultures isolated from living *N. pumilio* heart-rots were also studied from the last locality and were recorded as ET n°, but were not incorporated to the culture collection.

Macroscopic characters: Growth rapid, dishes covered during the 3rd week. Margin regular or slightly undulating, arachnoid, subfelty. Mat homogeneously subfelty and silky throughout the dish, aerial mat scarce, cream color, almost absent, rarely developing small areas of felty mycelium that are scattered on the agar. Odor none. Reverse bleaching.



Figs. 2-6. *Aurantioporus albidus*. Microscopic features of the fruitbody.- Fig. 2. Clamped hyphae from the context with thick, roughened walls.- Fig. 3. Thin-walled generative hyphae from the dissepiments.- Fig. 4. Basidia and spores.- Fig. 5. Spores, from holotype BAFC 33339.- Fig. 6. Spores, from BAFC 33338. Bars = 10 µm.

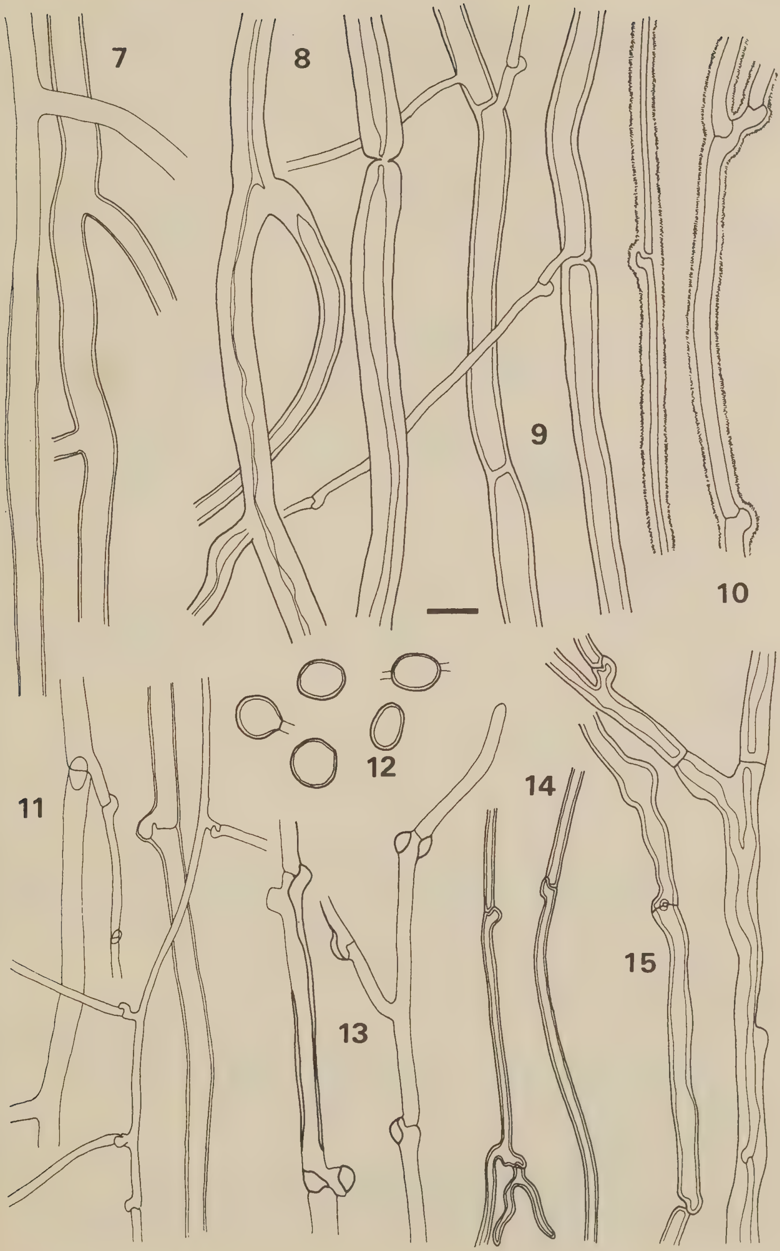
Oxidase reactions: gallic acid: ++ to +++, tr; tannic acid: + to +++, 0; tyrosinases: - to ++,5-7 cm.

Microscopic characters: Margin of simple-septate generative hyphae, 4-8 µm diam., unbranched or scarcely so, with hyaline, thin walls in the growing margin (Fig. 7) but become thickened to 3 µm or almost solid, then appearing glossy (Fig. 8) behind the edge of the margin. These hyphae lack septa at the growing margin but are simple-septate further back. They give rise to thin-walled, simple-septate or falsely-clamped generative hyphae, 1.5-4 µm; at about 2-4 cm from the margin, true clamps are formed on the generative hyphae (Fig. 9). These generative hyphae are thin-walled and (1)-1.5-4 µm diam. Clamped generative hyphae predominate as the mat matures (Fig. 11), but simple-septate hyphae were still present at the end of the study, even in the old areas around the inoculum. After the 4th week there were clamped generative hyphae, 4-6 µm diam., with hyaline, thickened, gelatinous and roughened walls (Fig. 10); their abundance varies from one culture to another. Chlamydospores globose or ellipsoid, terminal or intercalary, 7-15 x 5-12 µm, with hyaline, thickened walls (Fig. 12), present throughout the dish but more abundant toward the inoculum. Towards the end of the study the clamped generative hyphae may become thick-walled (Fig. 14) or may produce wall thickenings in the clamp or nearby (Fig. 13). Also, the simple-septate generative hyphae may exhibit unevenly thickened walls, leaving a meandering lumen (Fig. 15). Cultures did not fruit during the study but many of them fruited later. Regularly, daedaloid or lanceolated hymenophores are formed and they may produce thick spore prints.

Sexuality: bipolar.

Nine single-spore cultures from BAFC 33339 were distributed as: A_1: 1, 2, 8, 9 and A_2: 3, 4, 5, 6, 7.

Figs. 7-15.- *Aurantioporus albidus*. Microscopic cultural features.- Fig. 7. Thin and slightly thick-walled, simple-septate generative hyphae from the advancing mycelium.- Fig. 8. Thick-walled to almost solid, simple-septate generative hyphae.- Fig. 9. Clamped generative hyphae arising from wider, simple-septate hyphae.- Fig. 10. Clamped hyphae with thick, roughened walls.-Fig. 11. Clamped generative hyphae.- Fig. 12. Chlamydospores.- Fig. 13. Hyphae with thickenings located in the clamp areas.- Fig. 14. Thick-walled generative hyphae.- Fig. 15. Simple-septate and clamped hyphae with uneven wall thickenings. Bar = 10 µm.



Other ten single-spore cultures were obtained from BAFC 33339. These were used to perform a different confrontation test to determine the mating system of *A. albidus*, but the results were negative. Nevertheless, some of these monosporic cultures, n° 10, 11, 12 and 13, were used in compatibility tests (see below).

Nine single-spore cultures obtained from a spore print produced by culture ET-21 (Argentina, Chubut, Río Senguer, El Triana, from a white pocket heart rot in living *N. pumilio*, Apr.91) were distributed as:
A_1: 1, 3, 5 and A_2: 2, 4, 6, 7, 8, 9.

Single-spore cultures were also obtained from spore prints of cultures ET-59, ET-20 (both from the same locality and substrate as ET-21) and from CIEFAP 120, but the confrontation tests to determine sexuality did not show positive results, i.e. clamp formation. In the case of CIEFAP 120 no clamps were formed even though 20 single-spore cultures were confronted in all combinations.

Cytology

Spores: uninucleate and germinate after 4-5 days on MEA.

Monosporic cultures: the hyphal segments are multinucleate. Some assays of number of nuclei from the terminal cells backwards are as follows:
ET-20/4: 36-6-14-15-2-2-1-
        33-4-14-5-8-2-2-4-5-
ET-20/3: 6-2-2-1-2-
        3-2-3-1-1-1-1-
        43-2-3-1-2-

Polysporic cultures: either in aerobic or in anaerobic conditions the mycelia formed simple-septate and clamped hyphae. Simple-septate hyphae were multinucleate or coenocytic in the first hyphal segment. Some assays of number of nuclei from the terminal cell backwards were:
In anaerobic conditions:
ET-12: 136-8
        13-9-3-10-4-2-2-3-4-3-2- followed by n+n, clamped segments
        15-8-8-2- followed by n+n, clamped segments
CIEFAP 26: 75-5-4-23-
        68-10-
        more than 200 nuclei in the first segment
CIEFAP 117: 5-16-2-2-1-4-2-2- followed by n+n, clamped segments
        8-83-6-12-14-4-

CIEFAP 111: 16-85-21-
more than 70 nuclei in the first segment

In aerobic conditions:
ET-21: 7-2-4-3-2-3-2-1-
7-3-1-1-1-3-3-3-2-
7-3-4-9-4-5-2-6-
CIEFAP 111: 6-4-11-13-1-1-6-
3-3-4-1-1-3-7-
ET-57: 37-31-39-18-30-26-
more than 65 nuclei in the first segment
22-21-35-16-17-4-2- followed by n+n, clamped segments
CIEFAP 26: more than 300 nuclei in the first segment

In all the samples, clamped, dikaryotic generative hyphae were formed, specially towards the inoculum. The coenocytic hyphae were formed from the inoculum towards the margin, and had a radial and branched disposition, growing on the other hyphae and being wider than the others.

Nuclear behavior: astatocoenocytic.
Species Code: 2.4.(9).34.36.39.43.(48).54.59.65.

Remarks: *Aurantioporus albidus* is readily identified in the field by its white, thin, cartilaginous, effused or effused-reflexed fruitbodies. In culture it is easily identifiable by the combination of the thick-walled, simple-septate generative hyphae, the clamped generative hyphae with gelatinous, roughened walls, the chlamydospores and the positive oxidase reactions. The roughened walls of the generative hyphae are similar to those described for *Phlebia radiata* Fr. (Nakasone 1990).

Comparison with *Aurantioporus pulcherrimus* (Rodw.) P.K. Buchanan & I. Hood

From a microscopic point of view *A. albidus* is very similar to *A. pulcherrimus*, a species that has been recorded and described from native forests of Australia (Cunningham 1965) and New Zealand (Buchanan & Hood 1992), and from native forests (Borges da Silveira 1990) and *Eucalyptus* plantations (Rajchenberg & Meijer 1990, sub *Spongipellis* aff. *caseosus* (Pat.) Ryv.) of southern Brazil. Spores have the same shape and size in both species. Also the features of the hyphal construction are similar, in both species the generative hyphae are thick-walled, strongly agglutinated and embedded in a resinous-like substance. In *A. pulcherrimus* this substance is orange, whereas in *A. albidus* it is uncolored. *Aurantioporus pulcherrimus* is different from *A. albidus* in the following macroscopic features:

a) Larger fruitbodies, up to 15 mm thick.
b) Flabelliform, dimidiate or spathulate pilei.
c) Bright orange, crimson to deep salmon, or pale pink (when young) fruitbodies, when fresh (cfr. Fuhrer & Robinson 1992, for a colored photograph). The color fades to yellow-brown, dark-red or pale brown upon drying.

Having personally studied specimens of both taxa (Rajchenberg & Meijer 1990), the striking similarity of the spore shape and of the hyphal construction led me to perform compatibility tests to investigate the affinity between them. The following cultures of *A. pulcherrimus* were obtained from the International Collection of Micro-organisms from Plants, Landcare Research, Auckland (New Zealand) and were studied:

CIEFAP/cc 81: Australia, Tasmania, Franklin River bridge, Lyell, on *Nothofagus cunninghamii* log, leg. P.K. Buchanan 87/338, 17.May.87, det. PKB (specimen PDD 55163).

CIEFAP/cc 80: New Zealand, Taupo, Tongariro National Park, Mahuia Campsite, on dead standing trunk of *Nothofagus solandri* var. *cliffortioides*, leg. Y. Abe & P.K. Buchanan PKB 87/256, 8.May.87, det. PKB (specimen PDD 58329).

CIEFAP/cc 82: New Zealand, Taupo, track to Lake Rotopounamu, on old stump of *Weinmania racemosa* ?, leg. J.A. Bedford, P.K. Buchanan 85/001, 1.Jan.85 (specimen PDD 58335).

The above mentioned cultures of *A. pulcherrimus* were studied, the features being concordant with the descriptions of Nobles (1971) and Stalpers (1978). The cultures were microscopically similar to those of *A. albidus*. They differed macroscopically by their pinkish or orange pink, woolly or floccose mats.

The polysporic culture CIEFAP 82 fruited and a spore print was obtained. Fourteen monosporic cultures were confronted between them and were distributed as follows:

A_1: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 14 and A_2: 11, 12, 13.

The sexuality of *A. pulcherrimus* is, thus, bipolar.

Three monosporic cultures of *A. pulcherrimus* from Brazil were incorporated in this study. They were from collection: Brazil, Parana, Quatro Barras, on decayed stub of *Eucalyptus*, leg. A.A.R. de Meijer 1166, 1989 (cfr. Rajchenberg & Meijer 1990).

Compatibility tests between *A. albidus* and *A. pulcherrimus*

The results of MONO x MONO compatibility tests are presented in Table I. The results of DI x MONO compatibility tests are presented in Table II. Table III summarizes the results of Table 1 as percentages of wholly positive, negative or partially positive results.

The results of the compatibility tests show partial compatibility between *A. albidus* and *A. pulcherrimus*. About 55% of the confrontations had stable clamps either in the confrontation line exclusively or in one of the two partners only (i.e., only one of the mated strains was dikaryotized). Stability of the clamps present only in the confrontation line was confirmed by subculturing mycelia in a different test tube. The partial compatibility shown by both taxa was enhanced by the fact that positive hemicompatible results were obtained only after 10 weeks of confrontation. Prior checking of clamps showed their incomplete development, i.e. did not fully replace the monosporic strains and were restricted to a portion of the mycelium only. This indicates a very slow rate of dikaryotization in hemicompatible confrontations, as the growth velocity of all the cultures was rapid. Totally positive results, i.e. with both partners totally dikaryotized, were obtained in 6 weeks. Only 12.5% of the confrontations were totally positive. These results support *A. albidus* as a distinct taxon at the specific level. The common origin of *A. albidus* and *A. pulcherrimus* or the derivation of *A. albidus* from *A. pulcherrimus* seems evident.

Results of confrontations between specimens from Brazil and New Zealand are certainly puzzling (Table I). Here, a higher degree of totally negative results and a similar degree of hemicompatible results were obtained (Table II). This can certainly invalidate the previous interpretation. The DI x MONO mating test results (Table II) were negative between the polyspore cultures from Australia (CIEFAP/cc 81) and New Zealand (CIEFAP/cc 80) and the monospore ones from Argentina. But they were also negative between the New Zealand polysporic culture CIEFAP/cc 80 and the monosporic New Zealand cultures from CIEFAP/cc 82. On the contrary, totally positive results were obtained between the Australian polysporic culture and the monosporic cultures from New Zealand (CIEFAP/cc 82).

It thus seems, that a proper solution of this problem must rely, for the

Table I. MONO x MONO compatibility tests between *Aurantioporus pulcherrimus* from New Zealand & Brazil and *Aurantioporus albidus* from Argentina.

+ = clamp formation throughout the dish, when only indicated in the center of a confrontation, or restricted to one strain, when indicated in one side of the confrontation.

- = no clamp formation, either throughout the dish or in one strain only.

+ = few clamps formed, intermingled with simple septate hyphae, i.e. weak dikariotization.

Compatibility factors are assigned arbitrarily.

			Aurantioporus pulcherrimus						
			NEW ZEALAND				BRASIL		
			82/1 A1	82/2 A1	82/11 A2	82/130 A2	1166/1 Ax	1166/2 Ax	1166/3 Ax
Aurantioporus albidus	ARGENTINA	120/3 Ax	+ -	+ -	+ -	+ -	- + -	- + -	- +
		120/4 Ax	+ -	+ -	+ -	+ -	-	-	-
		111/9 A1	-	-	± -	+ -	- +	- + -	- + -
		111/5 A2	+ -	+ -	+ -	-	-	-	-
		111/7 A2	-	+ -	+ -	- +	+ -	+ -	-
		111/10 Ax	-	+ -	-	-	- ± -	-	-
		111/11 Ax	-	-	-	-	+ -	- + -	- ± -
		ET-21/3 A1	-	+ -	+ -	- + -	-	-	-
		ET-21/5 A1	+ -	+ -	+ -	+ -	-	-	-
		ET-21/8 A2	+	+	+	+	+	+	+

Table I (continued)

			Aurantioporus pulcherrimus						
			NEW ZEALAND				BRASIL		
			82/1 A1	82/2 A1	82/11 A2	82/130 A2	1166/1 Ax	1166/2 Ax	1166/3 Ax
Aurantiop. albidus	ARGENTINA	ET-21/9 A2	-	+ -	+ -	+ -	+ -	-	+ + ±
		ET-59/6 Ax	-	+	-	+	-	- ± -	-
		ET-20/19 Ax					- +	- +	- ± -
		ET-20/20 Ax					- +	+	+
		111/12 Ax					- + -	- +	- +
		111/13 Ax					+ -	+ -	- + -
A. pulcherr.	BRAZIL	1166/1 Ax	+	-	+ -	+ -			
		1166/2 Ax	+ -	+ -	-	+ -			
		1166/3 Ax	-	-	-	+ -			

time being, on morphology. It is proposed that *A. albidus* is a distinct specific taxon on account of its thin, effused-reflexed, white, cartilaginous fruitbodies.

Taxonomic remarks: *Aurantioporus albidus* shares with the type species of the genus, *A. croceus* (Pers.:Fr.) Murr., a fleshy consistency, shrinkage on drying, a resinous/cartilaginous texture of the context, a monomitic hyphal system composed of agglutinated, clamped generative

Table II. DI x MONO confrontations tests between polyspermic cultures of *Aurantioporus pulcherrimus* from New Zealand (NZ) and Australia (AUS) with monosporous strains of *Aurantioporus albidus* from Argentina (ARG) and with monosporous strains of A. pulcherrimus from New Zealand and Brazil (BRA).

Polysporic	x	**Monosporic**	
A. pulcherrimus	x	***A. albidus***	
NZ 80		**ARG 120/3**	
		ARG 111/5	
and		**ARG ET-21/8**	
		ARG ET-21/3	
AUS 81		**ARG 10696/1**	**All negative**
	x	***A. pulcherrimus***	
		BRA 1166/1	
		BRA 1166/3	
A. pulcherrimus	x	***A. pulcherrimus***	
AUS 81		**NZ 82/1**	
		NZ 82/2	**All positive**
		NZ 82/11	
		NZ 82/15	
NZ 80		**NZ 82/1**	
		NZ 82/2	**All negative**
		NZ 82/11	
		NZ 82/15	

Table III. Summary of MONO x MONO confrontation tests between *Aurantioporus albidus* from Argentina (ARG) and *A. pulcherrimus* from New Zealand (NZ) and Brazil (BRA). All the figures are expressed in % (cf. Table 1).

* Both + or Both- = both strains dikaryotized or not, respectively.

* NZ+, ARG+, BRA+ = only the New Zealand, the Argentinian or the Brazilian strain became dikaryotized, respectively.

* Conf. + = clamps only formed in the confrontation line.

	Both +	**Both -**	**NZ +**	**ARG +**	**BRA +**	**Conf. +**
ARG x NZ : 48 conf.	**12.5**	**31.2**	**52.1**	**2.1**	**---**	**2.1**
ARG x BRA: 36 conf.	**12.5**	**33.3**	**---**	**14.6**	**12.5**	**27.1**
BRA x NZ:12 conf.	**8.3**	**41.7**	**50.0**	**---**	**0**	**0**

hyphae and hyaline, smooth, ellipsoid spores. It differs by its thinner, white fruitbodies and the thickened spore walls. The latter feature points towards a relationship with *Spongipellis* Pat. *Aurantioporus albidus*, as well as *A. pulcherrimus*, can 'technically' be incorporated in that genus on account of their monomitic hyphal system with clamped generative hyphae, the associated white rot, the thick-walled, ellipsoid spores, bipolarity and astatocoenocity (David, 1969b). Nevertheless, it is still debatable whether to give more taxonomic weight to spore wall thickening or to fruitbody construction. Jahn (1973) pointed out the differences between *Aurantioporus* Murr., *Hapalopilus* Karst. and *Tyromyces* Karst., and underlined the similar hyphal construction of the species he included in *Aurantioporus*. He pointed out that the fruitbody coloration in *A. croceus* was not the same as the one found in species of *Hapalopilus*, a genus where *A. croceus* has generally been included (Domanski et al. 1973, Gilbertson & Ryvarden 1986, Bernicchia 1990, Ryvarden & Gilbertson 1993). Instead, he pointed out the similarities with *A. fissilis* (Berk. & Curt.) Jahn and *A. alborubescens* (Bourd. & Galz.) Jahn. Cultural features of *Aurantioporus*, *Spongipellis* and *Hapalopilus* are similar and cannot be used to distinguish between these genera. The same can be said regarding their nuclear behavior and sexuality (David 1969a, 1969b, 1988).

Species like *A. albidus* and *A. pulcherrimus* emphasize the difficulty in determing their 'proper' taxonomic placement of some species. The affinity between *A. albidus* and *A. pulcherrimus*, and the similarities of the latter with *A. croceus* (Buchanan & Hood 1992) would lead us to include all of them in *Hapalopilus* should *Aurantioporus* be neglected or considered a synonym of *Hapalopilus* (Ryvarden 1991, Ryvarden & Gilbertson 1993). If so, that genus would incorporate white and orange-pink species that do not show the characteristic reaction on KOH.

Finally, the species in *Aurantioporus* can perhaps be related with several tropical *Flaviporus* Murr. species (sensu Ginns 1980) which have a monomitic hyphal system composed of tightly agglutinated, clamped generative hyphae, i.e. *Flaviporus venustus* David & Rajchenberg (1985) and *F. hydrophilus* (Berk. & Curt.) Ginns (1980).

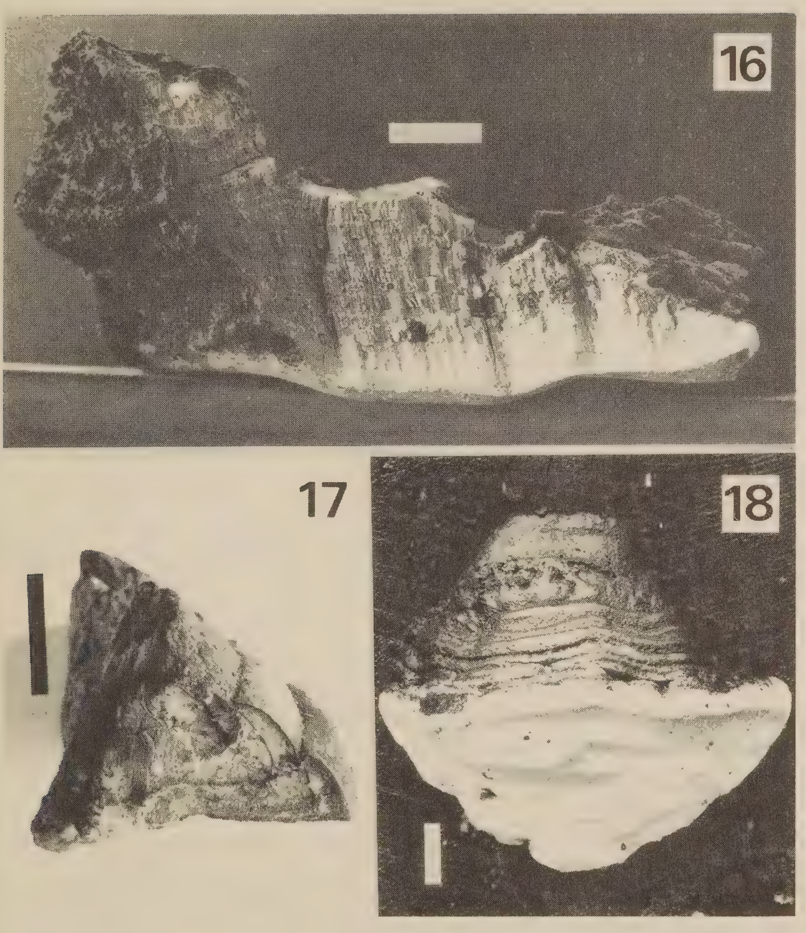
Fomitopsis minutispora Rajchenb. sp. nov.

Basidiocarpus perenni, resupinatus, effusus, effusus-reflexus, triquetrous vel ungulatus, coriaceus vel lignosus. Pileus laevigatus vel rugulosus, sulcatus, induratus, glaber, nigrescente . Contextus tenuis, castaneus vel carneus, usque 5 mm crassus, interstratis absens. Tubi cremei-albi in vivo, carnei in sicco. Pori 6.5-7.5 per mm.

Systema hypharum di-trimiticum, hyphis generativis fibulatis. Basidiis claviformibus, 13-15 x 5-6 µm. Sporis ellipsoideis vel cylindraceis, 4-5 x 2-3 µm, hyalinis. Species bipolaris normalis. Ligno putrescente brunneo consociata. Holotypus BAFC 33360.

Fruitbody perennial, resupinate, effuse (Fig. 16), effused-reflexed, triquetrous or ungulate (Figs. 17-18). On the lower face of fallen trunks fruitbodies are, at first, resupinate or effuse, and loosely but widely attached to the substrate; later they form elongated fruitbodies with reflexed portions up to 5 cm radius. When developing on standing trees or on cut ends of felled trees the fruitbodies are, at first, nodular; later on they form triquetrous or ungulate pilei that are widely and stongly adnate to the substrate. Pileus, when present, smooth or rugulose-crenulated, glabrous, with a stongly indurated surface that becomes black and tapers in thickness towards the margin (Figs. 17-18), sulcate, each sulcus corresponding to an annual growth portion (Fig. 17). An indurated black surface may also be formed against the substrate. When resupinate, forming large fruitbodies up to 30 x 12 x 8 cm; when triquetrous or ungulate up to 18 x 10 x 11 cm (width x radius x thickness at the base). Consistency coriaceous when fresh, woody upon drying. Context only present in pileate fruitbodies (Fig. 17), up to 5 mm thick, almost absent in resupinate ones and totally lacking between layers. Tubes up to 6 mm long, forming few (5) or numerous (more than 30) layers, according to the specimen. Margin regular and blunt, light chestnut-beige, soon darkening backwards upon indurating, most of the pilear surface being dark or very dark grey (5YR 4/1 3/1). The last layer of tubes creamish white when fresh, turning light beige upon drying, remaining so for 2-5 layers, but the older ones progressively darkening to light pinkish brown (5YR 8/3-8/4-7/4). Layers very easily separable. Pores circular, small, 6.5-7.5 per mm. Hymenial surface creamish white when fresh, fading to beige or yellowish tan (7.5YR 8/3-8/4, 10YR 8/3-8/4) upon drying.

Hyphal system di-trimitc. Generative hyphae clamped, 2-3.5-(4) µm diam., with thin to slightly thickened, hyaline or melleous walls (Fig. 19). Generative hyphae with irregularly thickened walls are also present in specimens with well developed context (Fig. 20); they are absent in the dissepiments and may be overlooked rather easily. Skeletal hyphae unbranched or with short lateral branches, 2-4 µm diam., with melleous, thick walls, abundant and predominant throughout the fruitbody (Fig. 21). Binding hyphae with short lateral branches, scarce or absent, when present very easily overlooked, 2-3.5 µm diam., with melleous, thick walls (Fig. 22). Cortex formed by generative hyphae with chestnut cytoplasmic contents, thickened walls and slightly melanized skeletal hyphae.



Figs. 16-18, *Fomitopsis minutispora*. Aspects of the fruitbodies.- Fig. 16. Effused basidiome, from BAFC 32798.- Fig. 17. Pileate fruitbody showing sulcate pileus and strata, from BAFC 32796.- Fig. 18. Triquetrous fruitbody, from holotype BAFC 33360.- Bars= 2 cm.

Basidia clavate, tetrasporic, 13-15 x 5-6 µm (Fig. 23). Spores hyaline, thin-walled, ellipsoid or short cylindric, 4-5 x 2-3 µm, IKI- , acyanophilous (Fig. 25). Cystidia absent. Cystidioles ellipsoid to bottle-shaped, with a slight ventricose base, with slightly thickened walls and an apical, thin-walled hyphoid prolongation (Fig. 24). The prolongation in some was longer than 70 µm and in some was sclerified. The latter form the skeletal hyphae that stuff the tubes.

Associated wood-rot: chestnut color.

Materials studied: ARGENTINA, Neuquén, Lanín National Park, Lago Lácar, ca. Quechuquina timber mill, on fallen trunk of *Nothofagus dombeyi*, leg. MR 10660, 10.Apr.92 (BAFC 32796). Ibid., leg.MR 10661 (BAFC 32797). Ibid., Hua-Hum, on fallen trunk of *Nothofagus alpina*, leg. MR 10665, 10.Apr.92 (BAFC 32800). Ibid., leg. MR 10666 (BAFC 32798). Ibid., Chachín, on fallen trunk of *N. alpina*, leg. MR 10675, 10.Apr.92. Ibid., leg. MR 10672 (BAFC 32799). Ibid., ca. Lago Queñi, in mixed forest of *Nohofagus alpina* + *N. obliqua* + *N. dombeyi*, on fallen trunk of *Nothofagus* sp., leg. MR 10851, 27.Apr.94 (BAFC 33360, holotype). Ibid., on standing *N. alpina*, leg. MR 10852, 27.Apr.94 (BAFC 33363). Ibid., on fallen trunk of *N. alpina*, leg. MR 10854 and 10855, 27.Apr.94 (BAFC 33364 and 33361, respectively).

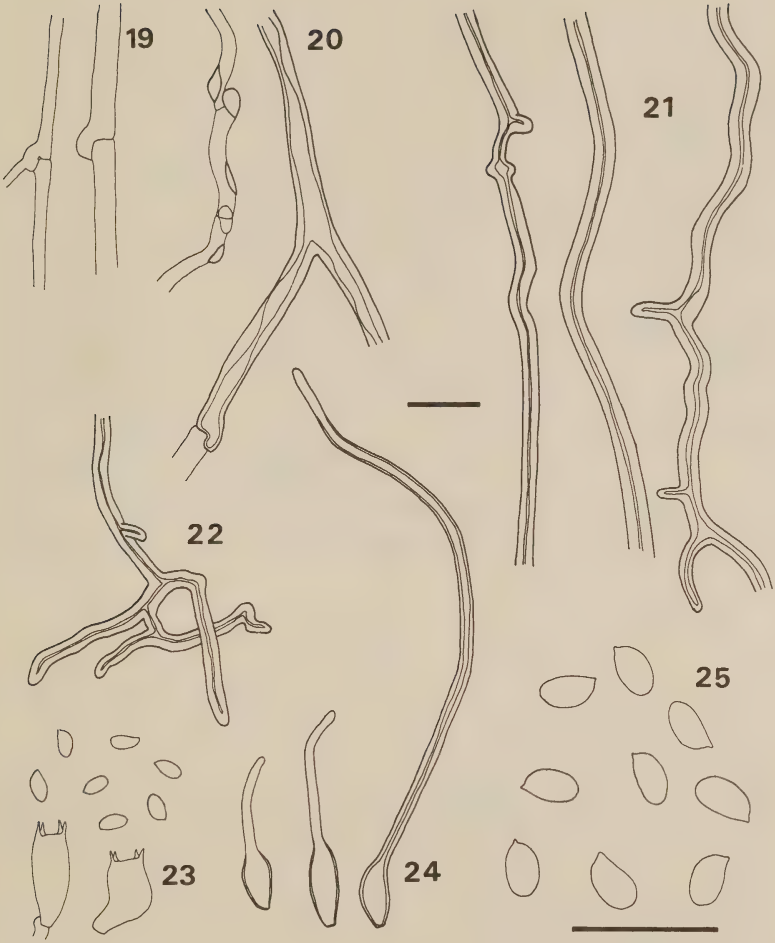
Cultural studies

Cultures studied (CIEFAP/cc): 74 (= BAFC 33360, holotype), 87 (= BAFC 33364), 109 (= BAFC 32800) and 138 (= BAFC 32798).

Macroscopic characters: Growth very slow, up to 7.0-8.5 cm at the end of the study. Margin slightly undulate, subfelty. Mat at first homogeneously felty, white, with one or two circular bands and a few subfelty radial strips; mat becoming felty towards the inoculum and developing beige radial strips towards the end of the study. Odor fruity. Reverse unchanged.

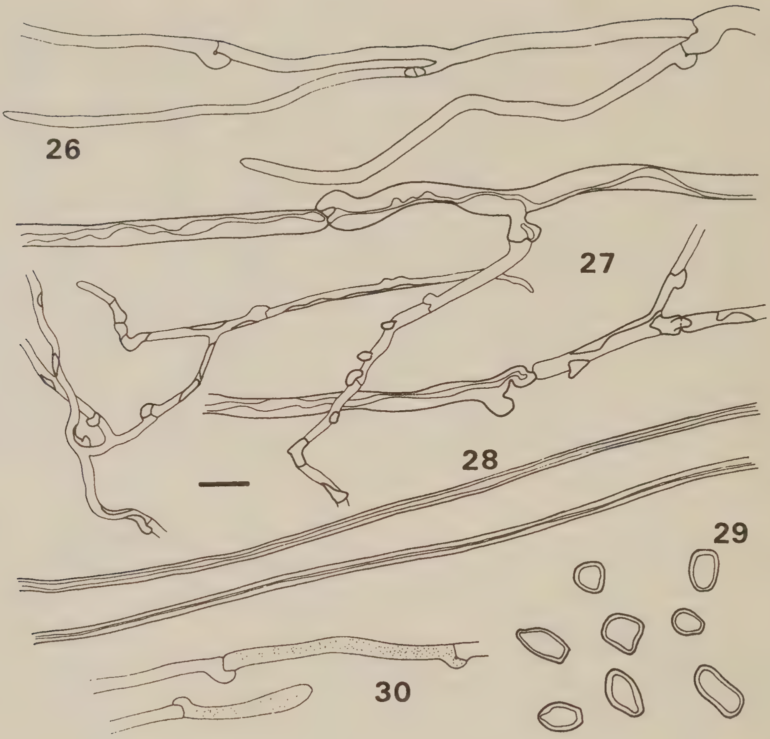
Oxidase reactions: gallic acid: -, 1.5 cm; tannic acid: (+), tr - 1 cm; tyrosine: -, 0.

Microscopic characters: Margin with clamped generative hyphae, with hyaline, thin or slightly thickened walls, branched, 2.5-4 µm diam.; further back the branches are narrower, 2 µm diam (Fig. 26). The generative hyphae develop irregularly thickened walls, 1.5-5.0 µm, branched, the wider ones becoming sclerified (Fig. 27). The narrower hyphae predominate and have localized thickenings along the hyphae. Chlamydospores globose or ellipsoid, 7-12 x 5-8 µm, with hyaline walls, up to 1.5 µm thick, few (Fig. 29). Fiber hyphae unbranched, 1-2 µm diam., with hyaline, slightly thickened walls; few and restricted to the area around the inoculum (Fig. 28). Beige-colored strips of felty mat are formed by generative hyphae with chestnut contents (Fig. 30).



Figs. 19-25, *Fomitopsis minutispora* (holotype BAFC 33360). Microscopic features of the fruitbody.- Fig. 19. Thin-walled, clamped generative hyphae.- Fig. 20. Generative hyphae with partially or totally irregularly thickened walls.- Fig. 21. Skeletal hyphae.- Fig. 22. Binding hypha.- Fig. 23. Basidia and spores. Fig. 24. Cystidiols. Fig. 25. Spores. Bars= 10 µm.

Sexuality: bipolar. Ten single-spore cultures (obtained from the fructification of culture CIEFAP 138) were distributed as:
A_1: 1, 3, 5, 6 and A_2: 2, 4, 7, 8, 9, 10.



Figs. 26-30, *Fomitopsis minutispora.* Microscopic cultural features.- Fig. 26. Clamped, thin-walled generative hyphae.- Fig. 27. Irregularly thick-walled generative hyphae.- Fig. 28. Fier hyphae.- Fig. 29. Chlamydospores.- Fig. 30. Generative hyphae with chestnut cytoplasmic contents. Bar= 10 µm.

Cytology

Spores: uninucleate.

Monosporous cultures: the hyphal segments are uninucleate and simple-septate.

Polysporic cultures: dikaryotic and regularly clamped, but oligonucleate (with 4-8 nuclei), apical hyphal segments may also be found.

Nuclear behavior: normal.

Species code: 1.(2).3.8.9.34.36.38.47.50.54.59.61.

Remarks: This species had been overlooked in previous visits to the area, in spite of the large size it may attain. It seems to prefer warm areas as it has not been found south in the *Nothofagus* forests. *N. alpina* is a preferred substrate. In culture, the mycelium may exhibit a weak positive reaction in tannic acid, feature already recorded for other species of the genus (Nobles 1965; Carranza-Morse & Gilbertson 1989).

Other small spored species of *Fomitopsis* and their differences with *F. minutispora* are:

a) *F. concavus* (Cke.) Cunningham (1965), with applanate fruitbodies and smaller spores 3-3.5 x 2-2.5 µm, known from Malaysia, New Guinea and the Fiji Islands.

b) *F. widdringtoniae* Masuka & Ryvarden (1992), a pileate, whitish species with globose spores, 4.5-5 µm diam., known from Malawi and growing on the gymnosperm *Widdringtonia nodiflora*.

c) *F. rhodophaeus* (Lév.) Imazeki (Ryvarden & Johansen 1980), a pileate, applanate species with flat and rather thin fruitbodies, known from Asia and Rwanda.

Postia carbophila Rajchenb. sp. nov.

Basidiocarpo annuo, resupinato, pusillo, discoideo, laxe affixo, canarino vel salmoneo, pori 1.5-2-(2.5) per mm. Systema hypharum monomiticum, hyphae generativae fibulatae metachromaticae, 2-4 µm latae, oleosae. Basidiis claviformibus, 9.5-19.5 x 4-5 µm. Sporis ellipsoideis, hyalinis, tenuitunicatis, 4-5 x 2 µm. Ligno putrescente brunneo consociata. Holotypus BAFC 33357.

Fruitbody annual, resupinate, loosely attached to substrate, up to 10 x 2.5 x 0.5 cm, confluent, disciform or more irregular, with several small umbos loosely attaching it to the substrate. Consistency slightly ceraceous or gossypine, friable when dry. Hymenial surface duckling yellow (10YR 8/8) or pink salmon (5YR 7/8), the color sometimes fading to slight salmon pink or remaining as a hue, light orange yellow or cream upon drying. Margin absent or if present a thin pellicle that curls up upon drying. Context cottony, white, very thin. Tubes up to 5 mm long. Pores 1.5-2-(2.5) per mm, angular or subgyrose with smooth, fimbriate or dentate dissepiments.

Hyphal system monomitic. Generative hyphae clamped. Context hyphae with thin to slightly thickened, hyaline walls, 2-4 µm diam., CrB +

(Fig. 31). Dissepiments with similar hyphae but the hyphal walls becoming thickened (Fig. 32). A resinous-like substance is present among the hyphae in the context, the dissepiments and on the hymenial elements, present as roundish or variably shaped guttulae of variable size (Fig. 33).

Basidia clavate, some pedunculate, tetrasporic, 9.5-19.5 x 4-5 µm (Fig. 34). Spores ellipsoid or shortly cylindric, hyaline, thin-walled, 4-5 x 2 µm, IKI - , acyanophilous and CrB - , generally with 1-2 guttulae in the cytoplasm (Figs. 35-36).

Associated with a brown wood-rot.

Materials studied: ARGENTINA, Chubut, Futaleufú, route 259 km 51, 'La 106' Ranch, on fallen, burnt trunk of *Nothofagus antarctica* in an *Austrocedrus chilensis* forest (main species) + *Lomatia hirsuta* + *N. antarctica*, leg. MR 10505, 25.Feb.92 (BAFC 33347). Ibid., leg. MR 10504 and 10506 (BAFC 33341 and 33345, respectively). Ibid., leg. MR 10703, 30.Apr.92 (BAFC 33343). Neuquén, Parque Nacional Lanín, ca. Lago Queñi, on fallen trunk of *Nothofagus* sp., in a mixed forest of *N. dombeyi* + *N. alpina* + *N. obliqua*, leg. MR 10858, 27.Apr.94 (BAFC 33357, holotype). Río Negro, El Bolsón, Loma del Medio, ca. Cabeza del Indio, on fallen, burnt trunk of *N. dombeyi* in mixed forest of *A. chilensis* and *N. dombeyi*, leg. MR 10758, 8.Mar.93 (BAFC 33344).

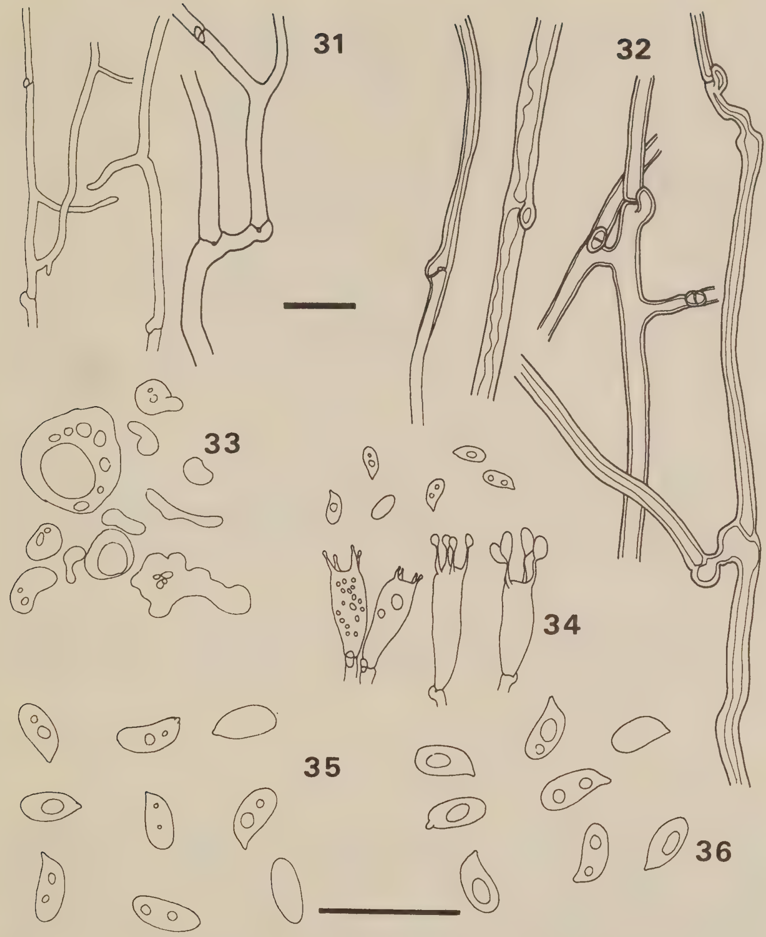
Cultural studies

Culture studied: CIEFAP/cc: 162 (= BAFC 33344).

Macroscopic characters: Growth extremely slow, not more than 1 cm at the end of the study. Margin regular. Mat tightly felty, at first white but becoming yellowish beige at the end of the study. Odor: none. Reverse: unchanged.

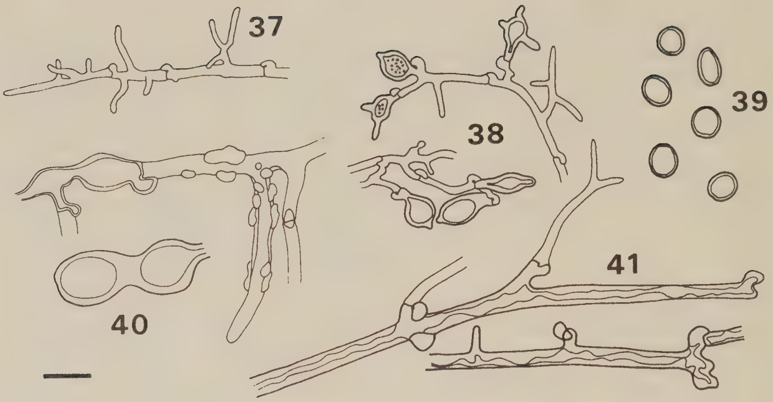
Oxidase reactions: gallic acid: - , 0; tannic acid: - , 0; tyrosinase: - , 0.

Microscopic characters: Advancing mycelium formed by clamped, thin-walled generative hyphae, 1.5-2.5 µm diam., arbuscularly branched (Fig. 37), soon forming ellipsoid, globose or mammiform chlamydospores (Fig. 38), 8-13 x 6-8 µm, with hyaline thickened walls (Fig. 39). The older generative hyphae may be wider, up to 4-6 µm diam., and may have intercalary, thickened-walled swellings that resemble chlamydospores, of up to 20 µm diam (Fig. 40). The walls of the hyphae remain thin or become irregularly thickened (Fig. 41) and are CrB - . An oily-like, amorphous substance clings on the hyphal walls (Fig. 40). Chlamydospores are profusely produced towards the inoculum.



Figs. 31-36, *Postia carbophila*. Microscopic features of the fruitbodies.- Fig. 31. Thin-walled generative hyphae.- Fig. 32. Generative hyphae with thickened walls.- Fig. 33. Resinous-like substance present among the hyphae and the hymenial elements.- Fig. 34. Basidia and spores. Fig. 35. Spores, from holotype BAFC 33357.- Fig. 36. Spores, from BAFC 33344. Bars= 10 μm.

Sexuality: Several monosporic cultures were obtained from specimen MR 10758. Spores germinated after a month. The extremely slow growth of these cultures hindered the possibility of making successful mating tests.



Figs. 37-41, *Postia carbophila.* Microscopic cultural features.- Fig. 37. Thin-walled generative hyphae.- Fig. 38. Hyphae forming chlamydospores.- Fig. 39. Chlamydospores.- Fig. 40. Hyphae with intercallary swellings and encrusted with an amorphous substance.- Fig. 41. Generative hyphae with irregularly thickened walls. Bar= 10 µm.

Nevertheless, through several confrontations the lack of formation of secondary mycelium could be established, which denoted the existence of an incompatibility system.

Species code: 1.3.9.21.26.32.37.38.47.54.58.

Remarks: *Postia carbophila* resembles *P. placenta* (Fr.) Lars. & Lomb. in the resupinate habit, the salmon coloured pore surface and the cylindric spores. Nevertheless, *P. placenta* differs in having an hygrophanous texture, rigid consistency upon drying, well attached basidiomes and larger spores 5.5-7.0 x 2.0-2.5 µm (Gilbertson & Ryvarden 1987; Bernicchia 1990). In culture, the mats of *P. placenta* have a much more rapid growth, covering the dish in four weeks (Nobles 1965; Stalpers 1978). *Postia rennyi* (Berk. & Br.) Rajchenb. has similar spores that differ in having slightly thickened walls. Also, the fruitbody is cream colored and much more cottony and fragile in consistency. It usually exhibits a mass of chlamydospores in the margin, in the context and in the dissepiments, giving the fruitbody a pulverulent aspect. *Postia rennyi* also differs in occuring strictly on gymnosperms, as recorded from Europe (Bernicchia 1990; Domanski 1972) and from the Patagonian Andes forests, where it has been found on *Austrocedrus chilensis* (Rajchenberg 1993).

From other species in *Postia* Fr., *P. carbophila* differs by the combination of spore size, pore size, color of the hymenial surface, fruitbody shape and attachment to the substrate, by the presence of a resinous-like substance between the hyphae and/or the hymenial elements, and the particular habitat and substrate. Cultures of this species are remarkable for their extremely slow growth.

Postia carbophila has a distinct ecological niche, so far restricted to old, burnt trunks of *Nothofagus* spp., and apparently requires undisturbed and quiet conditions to fruit. The associated wood-rot is difficult to discern in nature, as in most of the specimens studied the basidiomes were fruiting on charcoal. Nevertheless, the associated brown wood-rot could distinctly be checked in the trunk where the holotype was growing, and was confirmed while studying its culture.

From a strictly morphological point of view *P. carbophila* could be placed in *Ceriporiopsis* Dom. because of the presence of the resinous-like substance that covers the vegetative and hymenial elements in the fruitbody, the resupinate habit and the thin-walled ellipsoid to cylindric spores. However, *Ceriporiopsis* species produce a white rot of wood.

ACKNOWLEDGMENTS

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ASCOSPORE GERMINATION AND APPRESSORIUM FORMATION BY CYCLANEUSMA MINUS

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SUMMARY

Germinating ascospores of *Cyclaneusma minus* (Butin) Di Cosmo, Peredo and Minter were found to form hyaline appressoria on needles of *Pinus radiata* D. Don and on glass slides. Formation of appressoria, and ascospores with a mucilaginous coat or appendages, are diagnostic characters for species of Rhytismataceae infecting conifers.

INTRODUCTION

Ascospores of species of Rhytismataceae which infect conifer needles, germinate and form appressoria (Darker, 1932; Costonis, Sinclair & Zycha, 1970; Diwani & Millar, 1986: Osorio & Stephan, 1989). Species of *Cyclaneusma* DiCosmo, Peredo & Minter are reported to be an exception. According to Karadzic (1981), ascospores of *C. minus*

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(Butin) DiCosmo, Peredo & Minter germinate by means of one or more germ tubes which penetrate the host through stomata without appressorium formation. Osorio & Stephan (1989) reported that ascospores of *C. minus* did not produce appressoria when germinated *in vitro* for 12-24 h. However, in the course of studies of needle cast caused by *C. minus* on *Pinus radiata* D. Don we observed appressorium formation.

MATERIALS AND METHODS

Ascospore inoculum of *C. minus* was obtained by incubating at 21°C symptomatic, yellow-brown *P. radiata* needles inside moist chambers consisting of small plastic containers lined with moist filter papers.

Current year's shoots were cut from *P. radiata* trees, age eight years, in Sunny Corner State Forest (33° 25' S 149° 43' E), brought to the laboratory on the same day, and then stored in plastic bags at 4°C for not more than seven days. Undamaged healthy needle fascicles were removed from current year's shoot internodes. To enhance the longevity of the needles, the fascicular sheaths were not removed. Sheathed ends of the fascicles were surface sterilized in 4% sodium hypochlorite solution for 2 min., then the entire fascicles were washed thoroughly in tap water, rinsed in distilled water and blotted dry on filter papers.

Only one needle per fascicle was inoculated with *C. minus* ascospores. Using a micropipette, one small drop of sterile distilled water was placed on the abaxial surface of the needle. Ascospores of *C. minus* were discharged into this drop of water by suspending a small portion of hymenium picked from a fresh mature apothecium. When ascospores had been discharged (checked under a dissecting microscope at X40 magnification) the hymenium fragment was removed, and the inoculation site marked using indian ink. Inoculated needles were air dried at room temperature for 30 min. then, with the inoculated surface facing upward, placed inside Petri dishes containing sterile moist filter papers. The fascicles were incubated at 25°C in diffuse light.

Inoculated portions of the needles were excised, stained in 0.5% aqueous basic fuchsin, rinsed in distilled water and examined using an incident light microscope at X200 magnification. Selected segments were processed for scanning electron microscopy. The needle segments were fixed overnight in 3% glutaraldehyde in 0.025 M phosphate buffer (pH 6.8). The fixed materials were rinsed with 3 changes of the same buffer solution, then dehydrated in a graded series of ethanol (30%, 50%, 70% ethanol). They were usually stored in 70% ethanol for several days before being processed in a graded acetone dehydration series (70%, 80%, 90%, then 3 changes of 100% acetone). The samples were critical point dried using liquid carbon dioxide, coated with gold and examined with a SEM at 12kV.

Ascospores of *C. minus* were discharged into a small drop of sterile distilled water smeared onto a glass slide. The spore film was air dried at room temperature for approximately 30 min. Each slide was then incubated at room temperature overnight inside a 90 mm diameter plastic Petri dish. Germinated spores were fixed by immersing the slides in a Carnoy type fixative (3:1 absolute ethanol : glacial acetic acid) for 10 min. and stained using the HCl-Giemsa method (Hrushovetz, 1956).

RESULTS

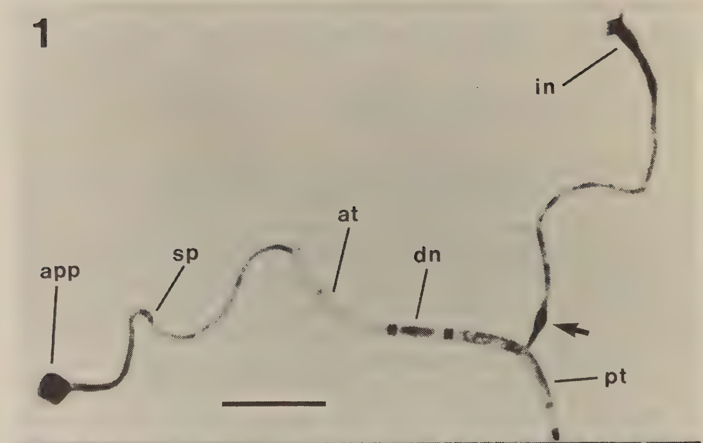
Ascospores of *C. minus* have long anterior and posterior cells and a short middle cell. Each cell of the spore has one nucleus. Spores germinated by producing usually one or two germ-tubes, 1.0-2.5 µm diameter, from both or either the anterior or posterior cell (Fig. 1). They very rarely germinated from the middle cell whose nucleus appeared to be more condensed and less active. Each germ-tube usually produced one or more side branches. After the germ-tubes had grown 10-210 µm long, they ceased elongating and their terminal ends started to swell (Fig. 1). The germ-tube remained aseptate, and the nucleus of the germinated cell began to migrate slowly into the germ-tube (into the older, leading germ-tube if more than one was produced by the cell) and then into the swollen apex of the main branch (Fig. 1). A hyaline appressorium was formed as the swollen apex containing the nucleus was delimited from the germ-tube by a septum (Fig. 1). Appressoria were usually clavate or spherical (Figs. 1, 2). All this took place within 24 h from the time ascospores were discharged into water droplets on glass slides or on pine needles. Wall thickening and melanization of the appressorium was not observed even after 3 weeks. After 24 h the nucleus in the middle cell usually broke down into a faint chromatin mass which sometimes appeared to adhere to the cell wall (Fig. 1). Occaisionally the nucleus of the middle cell migrated through the septal pore and into one of the adjacent cells, whose nucleus had migrated into a germ-tube. What happened to the nucleus then could not be determined.

Although the presence of free water seems to be essential for spore germination, too much water caused germ-tubes to float and continue elongating without appressorium formation. Germ-tubes of *C. minus* showed no affinity to stomatal openings and they usually grew over them.

DISCUSSION

Contrary to the results of other previously published studies we found ascospores of *C. minus* to germinate and form appressoria in a similar manner to other conifer inhabiting species of Rhytismataceae. Formation of appressoria seems to be a diagnostic character, as important as a mucilaginous coat or appendages on the ascospores (DiCosmo, Nag Raj & Kendrick, 1984), for this group of fungi. Among the conifer inhabiting Rhytismataceae, the shape of the *C. minus* appressorium is most like that of species of *Lirula* Darker and of *Lophodermium juniperinum* (Fr.) de Not. (Osorio & Stephan, 1989).

The pattern of behaviour of the nuclei in germinating ascospores of *C. minus* is rather different to that observed in other species of Rhytismataceae where the nucleus divides before a germ-tube develops (Osorio & Stephan, 1989). In *C. minus*, mitotic division of



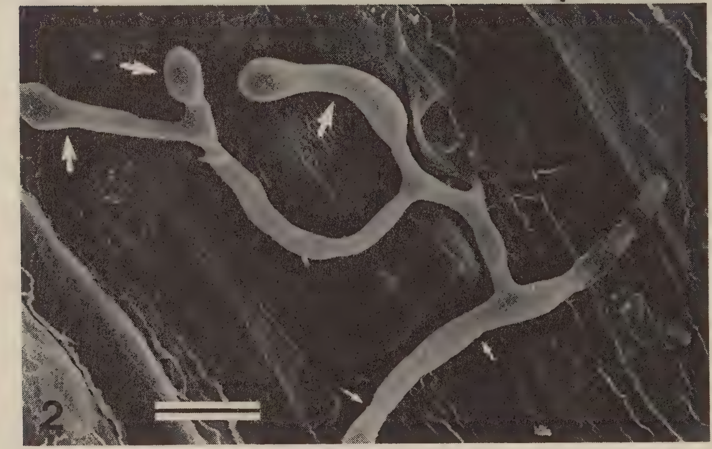


Fig. 1. Germination of *C. minus* ascospore *in vitro*. Nucleus (arrow) has entered the germ tube of posterior cell (pt) and is migrating towards the appressorium initial (in); nucleus of the anterior cell (at) has migrated into the appressorium (app) and a septum (sp) has formed. The nucleus in the middle cell is degenerating into a faint chromatin mass (dn). Bar = 20 μm.

Fig. 2. Germination of *C. minus* ascospore on *P. radiata* needle. A branched germ tube with three apical swellings (arrows); septa appear as thin rings of cell wall thickening (small arrows). Bar = 10 μm.

the nucleus occurs in the maturing ascospore while still in the ascus (Choi & Simpson, 1991).

In Australia, *C. minus* has been observed to be more prevalent on needles of *P. radiata* growing in relatively dry sites than *Lophodermium pinastri* (Schrad. ex Hook.) Chev. which is more abundant in moist sites (Stahl, 1966). Nuclear division in the maturing rather than the germinating ascospore, and rapid formation of non-melanised appressoria can be interpreted as adaptations to more xeric environments.

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MYCOTAXON

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A NEW SPECIES OF *RHYTIDENGLERULA* FROM EVERGLADES NATIONAL PARK, FLORIDA

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ABSTRACT

A new species of *Rhytidenglerula* is described from living leaves of *Trema micrantha* and compared with *R. trematis* . *Rhytidenglerula trematis* is lectotypified.

During a study of the fungi of Everglades National Park, a new species of *Rhytidenglerula* was found on living leaves of *Trema micrantha* (L.) Blume on Long Pine Key. This new species is described, illustrated and compared with *R. trematis* (Sydow) v. Arx found on *Trema guineensis* (Schum.) Fic., *T. orientalis* Blum and *T. micrantha* from Africa, Asia and South America.

Rhytidenglerula trematicola Castlebury, Crane & Huhndorf sp. nov. Figs. 1-10.

Coloniae epiphyllae, discretae, tenues, dispersae demum densae et effusae marginibus irregularibus. Mycelium e hyphis ramosis, septatis, atrobrunneis, rectis vel flexuosis, hyphopodiis praeditis, 3-5 µm latis compositum. Rami ad angulos rectos, haud opposti alium ramum vel hyphopodium. Hyphopodia continua, alterna vel unilateralia, brunnea, crassi-tunicata, irregularia re formis, marginibus sinuosis, lobatis vel sublobatis, 8-10 µm diam. Ascomata superficialia in hyphis exteris vel lamina radianti, discreta vel confluentia, fasciculata raro singularia, orbicularia ad aliquantum globosa, marginibus irregularibus, contracta ad basim, 37-53 µm alta, 46-73(-80) µm lata. Physes nullae. Asci bitunicati, plerumque 1-3, globosi, sessiles, octospori, 28-42 µm diam. Ascosporae cylindricae, cellulis extremis rotundatis, aequales vel subaequales, laeviter tunicatae, atro-brunneae, uniseptatae, constrictae ad septa, 18-26 X 10-14 µm. Anamorphe nulla. **HOLOTYPUS**: ILLS 51243.

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Colonies epiphyllous, discrete, thin, scattered becoming dense and effuse with irregular outlines. Mycelium composed of branched, septate, dark brown, straight or flexuous, hyphopodiate hyphae, 3-5 µm wide. Hyphal branches at nearly right angles, never opposite another branch or hyphopodium. Hyphopodia continuous, alternate or unilateral, brown, thick-walled, irregular in shape with sinuous lobate to sublobate margins, 8-10 µm diam. Ascomata superficial on external hyphae or radiating, shieldlike plate, discrete or confluent, clustered, rarely singular, orbicular to somewhat globose, irregular in outline, tapered at base, 37-53 µm high, 46-73(-80) µm wide. Physes none. Asci bitunicate, usually 1-3, globose, sessile, 8-spored, 28-42 µm diam. Ascospores cylindric, with rounded end cells which are equal to subequal, smooth-walled, dark brown, 1-septate, constricted at septa, 18-26 X 10-14 µm. Anamorph unknown.

HOLOTYPE: On living leaves of *Trema micrantha* (L.) Blume, Florida, Everglades National Park, Long Pine Key, Trail to Hammock No. 21(Mosier), 19 AUG 1985, leg. J.L. Crane & J.D. Schoknecht s.n., ILLS 51243. Isotype: NY.

Other material examined: 2 JAN 1986, leg. J.L. Crane & J.D. Schoknecht s.n., ILLS 51245. Pinelands near Hammock No. 23, 1 JAN 1987, leg. J.L. Crane & J.D. Schoknecht s.n., ILLS 51244.

Rhytidenglerula trematis Sydow was described from the same host in Venezuela by Sydow (1930) sub *Schiffnerula* and transferred to *Rhytidenglerula* by v.Arx (Müller & v.Arx, 1962). The holotype material of *Schiffnerula trematis* Sydow [as tremae] under No. 204 is apparently destroyed. We designate herein the following as **LECTOTYPE**: In foliis *Tremae micranthae*, Venezuela, El Limon pr. Puerto La Cruz. 9.1.1928, leg. H. Sydow in Fungi Exotici Exsiccati No. 859 at ILL. Both species are similar in ascomata, asci and ascospore measurements. *Rhytidenglerula trematis* is characterized by having obovate ascospores with one dark band in each cell, a slight constriction at the septum and a gradual tapering of the basal cell. *Rhytidenglerula trematicola* differs from the above species in ascospore morphology. The ascospores are deeply constricted at the septum, uniformly brown and have rounded cells.

ACKNOWLEDGEMENTS

We express our sincere appreciation to the National Park Service personnel at Everglades National Park for the necessary permits to conduct this study and to D.P. Rogers for correcting the Latin description.

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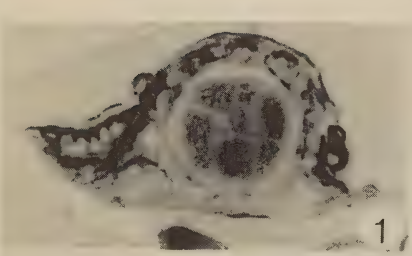
Figs. 1-10. *Rhytidenglerula trematicola* 1,3. Longitudinal section through ascoma x 547. 2. Ascoma on shield-like plate, x 273. 4. Ascus with mature ascospores, x 547. 5. Hyphae with hyphopodia, x 273. 6. Shield-like plate and hyphae, x 273. 7. Mature ascomata x 292. 8-10. Germinating and mature ascospores, x 547. Figs. 1-3, 5-6, and 8-10, bright field microscopy. Fig. 4, Nomarski differential interference contrast microscopy. Fig. 7, scanning electron microscopy.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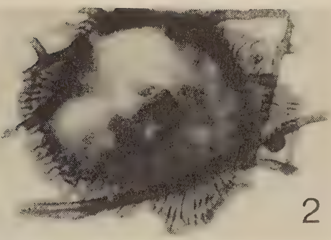
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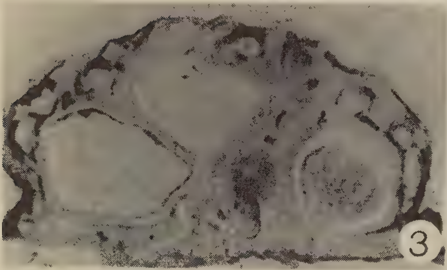
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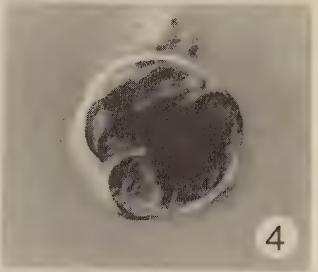
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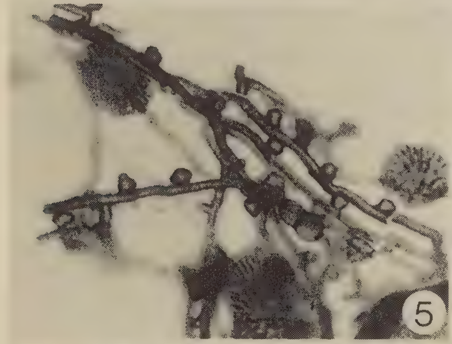
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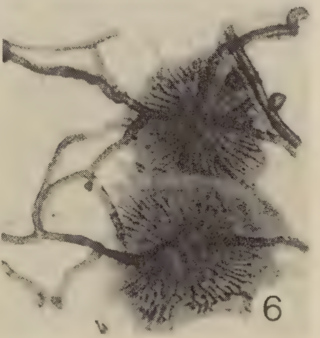
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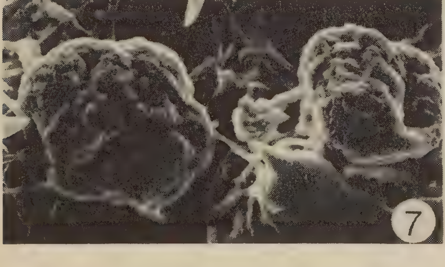
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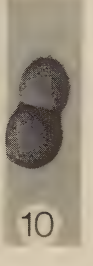
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MYCOTAXON

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A VARIETY OF UNUSUAL STRAINS OF *MICROSPORUM GYPSEUM* IN AGRA SOILS (INDIA)

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Introduction

During the survey for soil-inhabiting keratinophilic fungi and related dermatophytes in Agra soils, *Microsporrum gypseum* (Bodini) Guiart & Grigorakis was found to be the most frequently occurring dermatophyte (Singh *et al.*, 1990). Several unusual strains of this fungus were reported which differ from its type strain. An attempt was made to study them in detail in order to have a better understanding of their taxonomy.

The preliminary occurrence of this fungus in soil was confirmed under hand lens by its development of typical macroconidia on different keratin baits. Existence of the spores of this organism in soils suggests the possibility of the natural occurence of this keratinophilic organism as a geophilic fungus which is acting as a source of infection for man and animals.

These fungi were purified by transferring and maintaining them on suitable culture media. It was observed that these strains exhibit different morphological and physiological characters.

Materials and Methods

I. Morphological Characters:

The isolates of *M. gypseum* were grown on Sabouraud's Dextrose Agar medium (Peptone-10g, Dextrose-40g, Agar 20g in 1 liter of Distilled Water) at 26° C.for 8-20 days. During this growth period, these cultures were observed and their morphological characters such as colony characters, microscopic characters, etc., were recorded (Table 1 and Fig. 1). In the same way, certain physiological studies of these strains were also conducted as explained below and the results were recorded in Table 2.

II. Effect of medium on the growth of *M. gypseum* isolates.

The cultures of these strains were grown in different culture media (Glucose Gelatin medium , Richard's medium, Glucose Asparagine medium , Sabouraud's Dextrose medium and Potato Dextrose medium) in order to find out their nutritional requirements. Fifty ml of each of the above broth media were dispensed into 150 ml Erlenmeyer flasks and sterilized at 15 lb pressure for 15 min. Inoculum discs of 6 mm diameter were obtained from 8 day old cultures of each *M. gypseum* strain from its growing margin. After inoculation, the flasks were incubated at 28° C for 8 days. The flasks were taken out and the contents were filtered through pre-weighed filter papers. The mycelial weight of each fungus was obtained by subtracting the weight of the filter paper from the total weight.

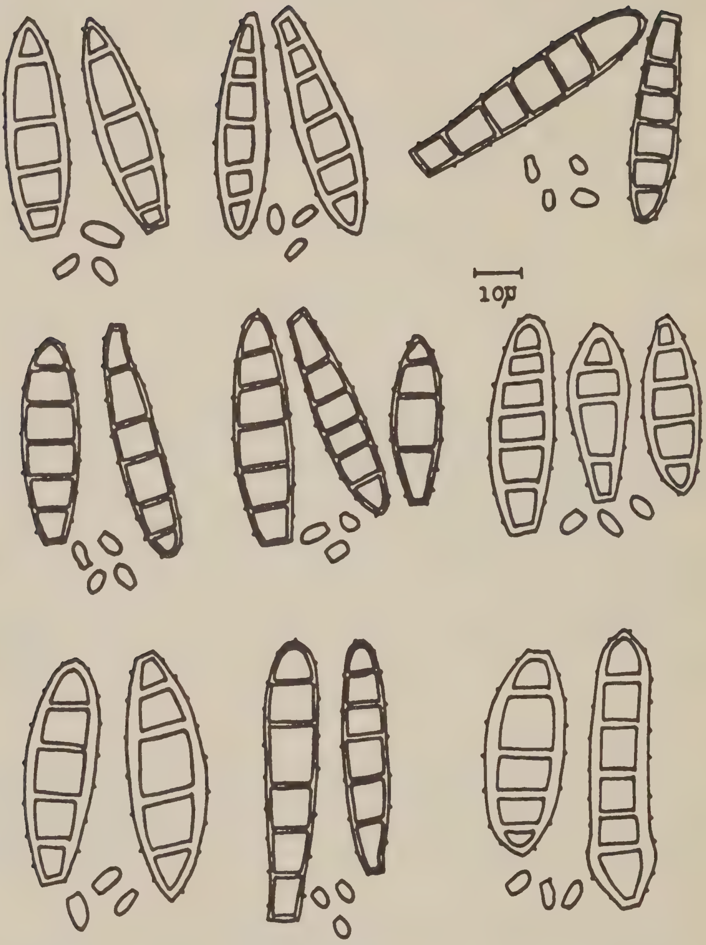

FIG.1. MACRO- AND MICROCONIDIA OF *M.GYPSEUM* STRAINS.
X 600

III. Effect of *M. gypseum* isolates in colonizing and degrading human hair.

To confirm the keratinolytic nature of these strains, a new method explained by the authors (Singh, *et al.*, 1989) was employed. Each strain was inoculated from 8 day old cultures grown on SDA in the middle of a sterile hair kept in a paired petri plate under aseptic conditions. A small amount of cotton dipped in distilled water was spread at the bottom of each glass rod to provide a humid atmosphere for the growing fungus. This cotton would also act as a cushion for the glass rods and keeps them in position. The whole assembly was kept in an incubator at 28° C for 20-50 days. The fungus developed a colony on the hair and its growth continued. After a few days, the hair was broken at the point of inoculation indicating the digestion of keratin of the hair and its disintegration by the test fungi.

IV. Keratin Degradation by *M. gypseum* isolates.

In order to measure the difference in their keratin degradation, the cultures were grown in Sabouraud's Dextrose Broth medium with buffalo skin as a keratin source for 20 days through the "weight loss" method (Fergus, 1969). The keratin substrates were cleansed by washing several times in tap water, cut into small pieces, washed with chloroform and finally rinsed in sterile distilled water as also suggested by Weary, *et al.* (1965). The substrates were sterilized by "dry-autoclaving" (Geetha Singh, 1981). An aliquot of 30 ml of the above SD broth was taken into 250 ml Erlenmeyer flasks. Two hundred and fifty mg of sterilized keratin substrate was added into each flask and sterilized at 15 lb pressure for 15 min. The flasks were inoculated with an inoculum disc of 6 mm diameter obtained from an 8 day old culture of the fungi and incubated at 28° C. for 20 days. In the same way, controls were run separately without adding the keratin substrate. After 20 days, the flasks were harvested and the mycelial mats were removed and dried at 80° C. for 24 hrs. The keratinolytic activity was measured through the "weight loss" methods described by Fergus (1969). The percentage weight loss of keratin materials by each fungus was calculated against controls and the values were shown in Table 2.

Table 2 Physiological Differentiation of Strains of *Microsporum gypseum*

Isolate	Mycelial Weight in Different Media in mg						
	Glucose Gelatin	Glucose Asparagine	Sabouraud Dextrose	Richard's	Potato Dextrose	Days to Break Human Hair	% Keratin degraded in Buffalo skin
Strain I PHLS 0640	295	56	576	65	246	16	37.6
II	285	41	658	63	285	25	13.4
III	365	28	618	113	265	17	18.0
IV	304	43	590	98	330	18	9.8
V	437	26	564	95	311	26	2.0
VI	345	38	626	125	273	24	18.2
VII	335	29	246	101	331	34	2.8
VIII	402	11	368	70	326	23	2.8
Type sp. PHLS 0641	246	37	255	76	333	10	10.8

Results and Discussion

I. Morphological Characters.

Typical descriptions of *M. gypseum* as it was reported for the first time was as follows:

Microsporum gypseum: Synonym-*Achorium gypeum* Boidin, 1907; *Microsporum flavescens* Horta, 1911; *M. scorteum* Priestly, 1914; *M. xantoides* Fisher, 1918.

Table 1 Morphological Differentiation of Strains of *Microsporum gypseum*

	Colony Characters		Microscopic Characters		Others		
Isolate	*Colour*	*Texture*	*Microconidia*	*Macroconidia*	*Chlamydo-spores*	*Colony Reverse*	*Racquet Hyphae*
Strain PHLS 0640	I Violet	Floccose	2.5-3.5μ x 4-9.3μ Abundant	25-55μ x 7.5-12μ Thick-walled	Present	Yellow	Rare
	II Buff centre with umbo & yellowish orange	Floccose	2.5-3μ 4-6μ Sparse	25-50μ x 7.5-10μ Thick-walled with round distal ends	Present	Brownish Yellow	Present
	III Buff	Floccose	2.5-3μ x 4-6μ sparse	25-60μ x 7.5-10μ thin-walled	Present	Yellow	Absent
	IV Deep Buff	Floccose	2.5-3μ x 4-6μ sparse	25-50μ x 7.5-10μ thin-walled	Present	Pale Yellow	Rare
	V Buff	Floccose	2.5-3μ x 4-6μ sparse	25-50μ x 7.5-10μ thin-walled	Present	Creamy	Rare
	VI Buff	Floccose	2.5-3μ x 46μ Abundant	22-55μ x 7.5μ Thick-walled	Present	Yellow	Absent
	VIII Buff	Floccose	2.5-3μ x 4-6μ sparse	25-55μ x 7.5-12μ thin-walled with round distal ends	Present	Yellow	Present
Type PHLS 0641	Buff	Floccose	2.5-3μ x 4-6.5μ Abundant	25-55μ x 7.5-14.5μ Thick-walled	Present	Yellow	Rare

It grows rapidly. The colony is fawn brown to buff or reddish brown and pigment is conspicuously visible on the reverse side of the colony. The surface is floccose, becoming powdery with production of many large septate macroconidia, colonies are zonate, with a powdery centre and more wooly or floccose growth in the younger mycelium in peripheral zones.

Macroconidia are produced in great numbers. They are 25-60 μ x 7.5-16 μ in size, broadly spindle-shaped (although not so pointed at the distal end as those of *M. canis)* with moderately thick walls and 4-6 sepatate. Microconidia 2.5-3 μ x 4-6 μ are produced sparsely but some times more freely in subcultures after several transfers on media in the laboratory (Figure 1).

Important morphological differences of the present isolates in comparison to that of the type strain were given in Table 1. These differences include (a) colony characters such as colour and texture, (b) microscopic characters such as microconidia, macroconidia and chlamydospores and (c) other characters such as colony reverse and presence or absence of racquet hyphae.

II. Effect of medium on the growth of *M. gypseum* isolates.

The cultures of *M. gypseum* strains were grown in different culture media in order to find out their nutritional requirements. Sabouraud's Dextrose (SD) was preferred most followed by Glucose Gelatine medium (GGM), Potato Dextrose medium (PD), Richard's medium and Glucose Asparagine medium. There were also some exceptions which are as follows:

(a) Strain VIII and strain IX preferred GGM to SD broth.
(b) Strain II and strain VIII preferred PDB to SD broth.
(c) Strain VII and strain V preferred SD broth to PD broth.
(d) Strain III preferred SD broth to GGM and PD broth.

III. Effect of *M. gypseum* isolates in colonizing and degrading human hair.

Activity of these strains on human hair was found to be different by the use of a new method devised by the authors (Singh, *et al.*, 1989). Among these, the Type species took only 10 days to break the human hair followed by strain I (16 days), strain III (17 days), strain IV (18 days), strain VIII (23 days), strain VI (24 days), strain II (25 days), strain V (26 days) and strain VII (34 days).

All the strains of *M. gypseum* exhibited keratinolytic activity. However, the difference in their keratinolytic activity may be due to the varied amounts of keratinase enzyme produced by them.

IV. Keratin degradation by *M. gypseum* isolates in Sabouraud's dextrose broth medium after 20 days.

Studies were carried out to measure the differences in their keratin degradation by the use of buffalo skin SD broth medium after 20 days of incubation by the "weight-loss" method (Fergus, 1969). In this, strain I was found to have the maximum ability to digest the buffalo skin (37.6%) followed by strain VI (18.2%), strain III (18.0%), strain II (13.4%), Type species (10.8%), strain IV (9.8%), strain VII (2.8%) and strain VIII (2.8%), strain V (2.0%). The order of the keratin degradation by these isolates varied in the case of buffalo skin when compared to that of human hair in the previous experiment. This may be due to the preferential utilization of keratin source by different fungi. This variation is quite obvious from the present study even among the strains of the same species.

The typical climate of Agra city, which is one of the well known international tourist centres of India, exerts a remarkable influence on the microfungi present in its various soils. The present study thus provides not only evidence of a remarkable variation of the *Microsporum gypseum* species but also offers a good scope for a better understanding of the ecology of keratinophilic fungi. We are not aware of the number of variants of keratinophilic fungi which are undergoing transmittable variations, nor how many new forms of keratinophilic fungi are hidden in soil nor how many are pathogens to man and animals.

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TAXONOMY AND NOMENCLATURE OF BISPORELLA CLAROFLAVA (LEOTIACEAE)

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ABSTRACT

Examination of the type specimens have proved *Helotium citrinicolor* P. & H. Crouan, *Helotium discedens* P. Karst., and *Peziza claroflava* Grev. are conspecific. *Peziza claroflava* has priority for this Discomycete and its placement in the genus *Bisporella* is proposed.

KEYWORDS: *Helotium citrinocolor*, *H. discedens*, *H. pezizoideum*, *Peziza claroflava*, *Bisporella claroflava*, Leotiaceae.

HELOTIUM CITRINOCOLOR

Helotium citrinocolor was introduced by the Crouan brothers for a discomycete collected on twigs of *Rubus* in west France (Bretagne) with a "Réceptacle de 2 à 4 milim., sessile, couleur citron," (P. & H. Crouan, 1867). Later, the species was reported by Saccardo (1889), Boudier (1907), who transferred it to *Calycella*, and by Grelet (1947). All three have cited the specific name erroneously as '*citrinicolor*' and, since no additional data were presented, it is evident that they were not familiar with the fungus from their own experience. The only known recent record of *Helotium citrinocolor* was reported by Svrček (1962, as '*citrinicolor*') who collected the fungus in Nízke Tatry Mountains, Slovakia, in 1960. An investigation of the specimen at PRM by the senior author, while studying Slovak species of the genus *Hymenoscyphus* (Nees) S. F. Gray (Lizoň, 1992), has indicated that *Helotium citrinocolor* is clearly not a member of *Hymenoscyphus*.

Authentic material of *Helotium citrinocolor* P. & H. Crouan at CO includes 5 specimens. The "type" specimen of *Helotium citrinocolor* is a mixture of three collections, of which one apothecium, packed separately, was marked by Le Gal as lectotype. The collection on *Rubus* twig(s) "Sur ...de Ronce" (P. & H. Crouan, 1867) should be separated after recognizing the host and designated as a lectotype. Apothecia of the lectotype and other specimens of the Crouans' collections are shallow cupulate, sessile, bright yellow, the disc is bright yellow to golden yellow, the receptacle is paler and naked. The excipulum is not clearly divided to ectal and medullary layers and is composed of thick-walled cells with gelatinized walls, forming a refractive tissue of interwoven to parallel hyphae. Ascospores are ellipsoid to fusoid, 0–1-septate, 7.0–8.0 x 2.0–2.5 µm and 8–11 x 2–2.5–3 µm according to Le Gal (1953), and paraphyses extend above the asci. A few hyaline phialides, up to 5 µm long, were observed by us on the outer surface of the receptacle.[1]

The Slovak specimen of *Helotium citrinocolor* appears to be conspecific, and has golden yellow apothecia when dry, becoming straw yellow when rehydrated, 1–2 mm diam., sessile to subsessile. The ectal and medullary excipulum is composed of parallel to interwoven cells 5–11.5 µm long, with clearly gelatinized walls, elongated toward the margin. Asci are 56–81.5 x 5.3–7 µm, pore blue in Melzer's reagent. Ascospores are ellipsoid, ellipso-clavate or inequilateral, nonseptate, 0–3-gutttulate, (8.4–) 10.4–12.4 (–13.4) x (2.4–) 2.7–3.4 (–3.7) µm.

HELOTIUM DISCEDENS

Helotium discedens P. Karst. was described from a Brasilian collection on the bark of an unidentified broad-leaved tree. Carpenter considered *Helotium citrinocolor* synonymous with *Bisporella discendens* (P. Karst.) S. E. Carpenter judging by his notes on the type specimen of the former. We have examined a lectotype (designated by Carpenter, 1975) and another Karsten specimen at H and a specimen of *Bisporella discedens* collected in Puerto Rico (CUP–PR 4164) as identified by him and agree with his conclusion. We have not studied type specimens of *Niptera subiculata* Seaver or of *Trichopeziza aurea* Rick, and we accept Carpenter's decision

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[1] All observations based on dry specimens.

(Carpenter, 1975) that they are synonymous with *Bisporella discedens*.

HELOTIUM PEZIZOIDEUM

We have studied the holotype of *Helotium pezizoideum* M. C. Cooke & W. Phillips which contains probably only one apothecium. It has similar characters to *Peziza claroflava* but we have some reservations on the excipular structure and thus we report it as a synonym with a question mark.

PEZIZA CLAROFLAVA

The Crouans (on the type specimen label and on drawings at CO) annotated their new *Helotium citrinocolor* as "*Helotium claroflavum* Berk. Outlines?" and as "*Helotium claroflavum* (Grev.) Berk." Le Gal (1953) has pointed out that the name *Peziza claroflava* Grev. [≡*Helotium claroflavum* (Grev.) Berk.)] could have priority if the names are synonyms.

Greville's collections at E, labeled *Peziza claroflava*, consist of three specimens. The type specimen envelope includes two collections (syntypes), both from Braid Hermitage [near Edinburgh], one dated September 1821 and the other November 1821. Nannfeldt (1936) "saw what may be the specimen referred to by Massee, viz. in Cooke's handwriting: Helotium claroflavum – ex Grev." at K (which is a portion of one of the syntypes) and has noted "this specimen is typical young *Calycella citrina* (Hedw. ex Fr.)." Dennis (1956) examined probably the same "authentic material at Kew" of *Peziza claroflava* and agreed with Nannfeldt's conclusion. Nannfeldt's (and Dennis') conclusion was followed by Cannon, Hawksworth & Sherwood-Pike (1985).

Greville did not designate the type (holotype) specimen in his collection at E and the collection at K is presumably (as noted on the label) a part of one of these specimens removed by M. C. Cooke: thus both the September and November portion of the type collection at E, as well as the portion of one of these at K are syntypes.[2] Since both at E are immature we designate the specimen at K, which possesses mature characters, as the lectotype.

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[2] Art. 9.7 of the 1994 International Code of Botanical Nomenclature (ICBN).

The structure of the excipulum and other characters clearly show that all collections studied of *Helotium citrinocolor*, *Helotium discedens*, *Peziza claroflava*, and probably also *Helotium pezizoideum*, are conspecific, and have to be placed in *Bisporella*. The correct name for this fungus must be based on *Peziza claroflava*.

FORMAL TAXONOMY OF BISPORELLA CLAROFLAVA

Bisporella claroflava (Grev.) Lizoň & Korf, comb. n.
≡ *Peziza claroflava*[3] Grev., Fl. edin. p, 424, 1824 [basionym].
≡ *Helotium claroflavum* (Grev.) Berk., Outl. Brit. fungol. p. 372, 1860.
≡ *Calycella claroflava* (Grev.) Boud., Hist. classific. discomyc. Europe p. 95, 1907 ["*caroflava*"].
= *Helotium citrinocolor* P. & H. Crouan, Fl. Finistère p. 48, 1867.
≡ *Calycella citrinocolor* (P. & H. Crouan) Boud., Hist. classific. discomyc. Europe. p. 95, 1907 ["*citrinicolor*"].
= *Helotium discedens* P. Karst., Hedwigia 28:191, 1889.
≡ *Calycella discedens* (P, Karst.) Dennis, Kew Bull. 1954:320, 1954.
≡ *Bisporella discedens* (P. Karst.) S. E. Carpenter, Mycotaxon 2:124, 1975.
= ? *Helotium pezizoideum* Cooke & W. Phillips, Grevillea 19:72, 1891.
= *Niptera subiculata* Seaver, Mycologia 16:8, 1924.
= *Trichopeziza aurea* Rick, Brotéria, Ser. Bot., 25:103, 1931.

Le Gal (1953) reported *H. citrinocolor* as a "connu et cosmopolite" species even though not reporting any out-of-France collections. Carpenter (1975) has reported several collections of *Bisporella discedens* from the tropics and only one from temperate regions. Our present knowledge of the distribution of *Bisporella claroflava* includes in Europe: Belgium (Saccardo, 1889, as *Peziza claroflava*), England, U. K. (Ramsbottom & Balfour-Browne, 1951, as *P. claroflava*), France (P. & H. Crouan, 1867, as *Helotium citrinocolor*), Ireland (Muskett & Malone, 1983, as *P. claroflava)*, Scotland, U. K. (Greville, 1824, as *P. claroflava*), Slovakia (Svrček, 1962, as *H. citrinocolor*), Switzerland (Carpenter, 1975, as *Bisporella discedens*); in the western Hemisphere: Bolivia (Dennis, 1959, as *Calycella discedens*), Brasil (Karsten, 1889, as *H. discedens*), Colombia,

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[3] Hyphen deleted according to Art. 60.9 of the 1994 ICBN.

Dominica, Guadeloupe, Haiti, Puerto Rico, Venezuela (Carpenter, 1975, as *B. discedens*), Cuba (Dennis, 1954, as *C. discedens*); in Asia: China (Korf & Zhuang, 1985, as *B. discedens*), Philippines (Carpenter, 1975, as *B. discedens*); in New Zealand (Dennis, 1961, as *C. discedens*, Carpenter, 1975, Johnston, 1988, as *B. discedens*); in South Africa (Saccardo, 1889, as *P. claroflava*).

As pointed out by Carpenter (1975) there is great variability in some characters, such as the coloration (white to bright yellow) and the shape of the apothecia (sessile to strongly stipitate). The species fruits on twigs of *Coprosma grandifolia*, *Corylus avellana*, *Muehlbeckia australis*, *Piper*, *Populus tremula*, *Prunus*, *Rubus*, *Salix*, *Ulmus*, palms and other unidentified species.

SPECIMENS EXAMINED: France, Sur ramule de ronce, février 1862, Sur ramule mort de prunellier, Avril 1862, Sur ramule mort de Saule, 26 Novembre 1863 (CO – "specimen I." as designated by Le Gal, 1953, LECTOTYPE of *Helotium citrinocolor*); Sur ronces pourries, le 6 Mai 1865 (CO, *H. citrinocolor* – "specimen II." as designated by Le Gal, 1953); Sur branche décorticée et pourrie de tilleul à Coatodon, le 2, 9^{bre} 1868 (CO, *H. citrinocolor* – "specimen III." as designated by Le Gal, 1953); le 12 février 1869, sur Orme (CO, *H. citrinocolor* – "specimen IV." as designated by Le Gal, 1953); sur branches mortes décortiqées d'Orme, le 26 février 1869 (CO, *H. citrinocolor* – "specimen V." as designated by Le Gal, 1953). Slovakia, Nízke Tatry: in valle rivi Trangoška, *Rubus idaeus*, 1200–1500 m, 8.IX.1960, M. Svrček (PRM 614218, as *H. citrinicolor*). [Scotland, U. K.] [no data on the label] "ex Grev" (K – LECTOTYPE of *Peziza claroflava*, M. C. Cooke collection); Braid Hermitage, Sept. 1821 (E, LECTOPARATYPE, or probably ISOTYPE of *P. claroflava*); Braid Hermitage, Nov. 1821 (E, LECTOPARATYPE, or probably ISOTYPE of *P. claroflava*); on Hazel, from A. Jerdon (E, as *P. claroflava*); Appin, leg. Carmichael (E, as *P. claroflava*). Brasilia, Minas Geraes, Sitio, 1885, E. Wainio (H – herb. P. Karsten 1268, LECTOTYPE of *Helotium discedens* designated by Carpenter, 1975); Brasilia, Minas Geraes, Sitio, E. Wainio (H – herb. P. Karsten 1267, ISOTYPE of *H. discedens*). Puerto Rico, On twig, Along Rio Nueve Pasos, Dr. Luis Roure's property near Rosario, 140 m, 17.VI.1970, R. P. Korf & al. (CUP–PR 4164, as *Bisporella discedens*). [New Zealand] Waitaki [on dead wood, amongst mosses]. (K – herb. M. C. Cooke 281, HOLOTYPE of *Helotium pezizoideum*).

RELATIONSHIPS WITHIN THE GENUS

Many species of *Bisporella* are associated with other fungi (Korf & Carpenter, 1974). Although there are several perithecia of *Nectria magnusiana* Rehm in the specimen of *Helotium claroflavum* collected by Carmichael (E), no connection between these two fungi has been found.

Carpenter (1975) has assigned the anamorph of *Bisporella discedens* to *Cystodendron* Bubák, but Johnston (1988) stated that it should be placed in the genus *Bloxamia* Berk. & Br. The junior author (unpublished data) studied anamorphs in several *Bisporella* species and also concluded that *Bloxamia* is the logical genus for them. We have observed similar phialides in specimens we studied determined as *Helotium citrinocolor* and *Bisporella discedens*.

Korf & Zhuang (1985) expressed doubt if *B. discedens* can be really distinguished from the common *Bisporella sulphurina* (Quél.) S. E. Carpenter. This species seems to be really closely related to *B. claroflava* and it may be conspecific. Quélet's collections were partly destroyed (Gilbert, 1949) and also the type specimen of *Helotium sulphurinum* Quél. is missing at PC (R. Cailleux, in litt.). Until a lectotype or neotype is chosen for Quélet's species, no conclusions can be made.

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BOOK REVIEWS

D. S. Hibbett, Book Review Editor

Ascomycete Systematics: Problems and Perspectives in the Nineties, edited by David L. Hawksworth. Hardcover, 170 x 257 mm, 453 pp, 1994. NATO ASI Series, Series A, Life Sciences Vol. 269. Plenum Press, 233 Spring Street, New York, NY 10013. ISBN 0-306-44882-3. US $90.-.

This book is a fascinating report of the First International Workshop on Ascomycete Systematics, held in Paris on May 11-14, 1993, involving 140 researchers from 24 countries, and supported by the Association Française de Lichénologie and NATO (as one of their NATO Advanced Research Workshop series). The first paragraph of the Foreword states the *raison d'etre* for such a workshop: "In the important world of the Fungi, the ascomycete group is not only the largest in the number of species, but also the one with the most medical, pharmaceutical, and nutritional applications." There were two distinct parts to the Workshop, the first two days being devoted to reviews of criteria used in ascomycete systematics and general characteristics and problems in Ascomycetes. The last two days were more technical, basically discussions arranged around the "Outline of the Ascomycetes" proposals that are the foundation of the ascomycete presentations in the volumes of the journal *Systema Ascomycetum*. (The 1993 "Outline" prepared after the Workshop appears on pp 425-429.) What is particularly delightful is that not merely the prepared texts of the talks and discussion groups are presented here, along with the figures from the slides that were projected, but also the lively discussions that followed have been included, edited from tapes and notes presented to the organizers by the speakers. While there are obviously some errors in transcription of those comments, most appear to this reviewer (who was an audience and rarely panel discussant during many of the talks) to capture the essence of the discussions.

The first chapter, "Ascomycete Systematics in the Nineties," by D. L. Hawksworth and J. Mouchacca, summarizes the "key issues" that emerged at the Workshop: "The Systematic Value of Different Categories of Characters" is broken down into (i) Ascoma, Conidioma, and Thallus Structure and Ontogeny, (ii)

Ascus and Ascospore Structure, (iii) Septal Structure, (iv) Secondary Metabolites, (v) Paleomycology and Biogeography, (vi) Ecological Strategies, Species Concepts, and Population Biology, (vii) Cladistics, and (viii) Molecular Biology. "Problems in Particular Groups" reflects some of the technical matters discussed on the last two days of the Workshop. "Challenges for the Future" reflects Hawksworth and Mouchacca's views under the headings (i) The Holomorph Concept, (ii) Supraordinal Ranks, (iii) Terminology, (iv) Working Practices and Data Capture, (v) Meeting the Needs of Users, and (vi) The Mismatch Between Resources and the Knowledge Gap.

In no way can a brief book review attempt to point out even the most important conclusions and conjectures that arose at this Workshop. So many major workers had so much to say on so many diverse topics that all this reviewer can suggest is that each serious or even fledgling student of the Ascomycetes (and their anamorphs) examine the book carefully. Each will find this volume to be an awesome source of inspiration for its attention to the unanswered (and perhaps unanswerable) questions awaiting researchers of the future. It will certainly lead the novice to discover how little most of us who have been active in the field of Ascomycete Systematics know about our subject!

This book deserves to be on the bookshelf of all teaching institutions where mycology is presented, should be consulted by all commercial concerns that hope to make a profit from fungi and fungal products, and perhaps most of all should be perused by granting agencies and the panels that decide on what mycological work needs support: the evidence is detailed here, from compelling arguments to fund expensive and sophisticated studies on molecular systematics to a tacit understanding that without massive support for additional field-based studies we will have lost our opportunity to "use" the fungi we otherwise will have lost as man continues to destroy the tropical rainforests and other refuges of biological diversity. *Richard P. Korf, Plant Pathology Herbarium, Cornell University, Ithaca, New York.*

European Polypores Part 2, Meripilus - Tyromyces, by L. Ryvarden and R. L. Gilbertson. Hardcover, 170 x 230 mm, 349 pp, 1994. Fungiflora A/S, P.O. Box 95, Blindern, N-0314 Oslo, Norway (fax 47-22469731). ISBN 82-90724-13-6.

With the arrival of this companion to **European Polypores** Part 1 (see MYCOTAXON 49: 490-491, 1993) we have a complete regional flora for poroid and related basidiomycetes of

Europe. The generic concepts and the range of genera and families treated here are essentially the same as in the corresponding two-volume treatment of **North American Polypores**, by the same authors. The family level classification followed is again that of Donk. By the author's own admission, the taxa treated here are not a monophyletic group, and certain non-poroid taxa that are presumably closely related to polypores have been specifically excluded (e.g. *Lentinus* and certain corticioid fungi). This may limit the value of the book for some specialists, but it in no way detracts from its utility as a floristic treatment and diagnostic tool for polypores.

Part 1 included introductory chapters discussing taxonomic characters, pathology, decay, mycogeography, and a key to families and genera, followed by descriptions of species in the genera *Abortiporus* to *Lindtneria*. Part 2 carries on with descriptions of species in *Meripilus* to *Tyromyces*, followed by a list of authorities and their abbreviations, a treatment of the etymology of specific and generic names, the references, and a taxonomic index. The latter two items will be especially welcomed by those who until now have had to work with Part 1 alone. In general, Part 2 adheres to the same standardized format that was adopted in Part 1. Genera represented by multiple species are provided with dichotomous keys to species, and the larger genera have useful synoptic keys as well (e.g. *Phellinus, Polyporus, Trametes*). Each species is described in terms of a standardized set of character fields: macromorphology, hyphal system, cystidia and other sterile hymenial elements, basidia, basidiospores, rot type, mating system, substrate, and distribution. Cultural characters are not discussed, but there is ample reference to available literature for each species. Anatomical illustrations and a European range map are provided for each species. Many of the species treated here were also described in **North American Polypores**, but in all such cases new illustrations have been prepared for the present volume. This enables the reader to gain a sense of the range of morphological variation in certain species. Habit sketches have been provided for twenty-six species, but were not present in Part 1. These nicely illustrate certain macromorphological features, but would be more useful for identification if all species had been drawn.

There are a few minor discrepancies between Parts 1 and 2, but none that seriously limit the utility of the pair. For example, a glossary was promised in part 1, but is absent from Part 2. However, chapters 2 and 3 in Part 1 adequately describe and illustrate morphological characters, rendering a glossary for this material superfluous. The treatment of *Ceriporiopsis* is a potential source of confusion. In Part 2, several species of *Skeletocutis* are transferred into *Ceriporiopsis*, which was covered in Part 1. The transfers necessitated an expanded key to *Ceriporiopsis* as well as descriptions and illustrations of the new combinations in Part 2, under *Skeletocutis*, where they might not be expected.

Despite these minor flaws, **European Polypores** Part 2 presents a coherent and useful taxonomy for a diverse, important group of fungi. It would be an error to conclude that this book is only relevant for students of European polypores. As noted, many of the species treated here occur outside of Europe. Furthermore, the present volume should be considered in the context of the authors' previous contributions to taxonomy of polypores on a global scale. Throughout these works, the authors clearly define generic concepts and taxonomic characters, and adhere to a standardized set of character fields for descriptions and illustrations. This makes the character basis of their taxonomy readily apparent and accessible, and promises to contribute to a unified, stable classification for polypores worldwide. This is an important reference for all students of polypores and should serve as a model for other floristic studies. *D.S.H.*

Myxomycetes: A Handbook of Slime Molds, by Steven L. Stephenson and Henry Stempen. Hardcover, 150 x 235 mm, 200 pp with 16 color plates, 1994. Timber Press, Inc., 133 S.W. Second Avenue, Suite 450, Portland, OR 97204-3527 (fax 503-227-3070). ISBN 0-88192-277-3. US $34.95 plus $4.95 shipping and handling.

Myxomycetes make up a fascinating group of organisms that are frequently overlooked even by mycologists. This new handbook promises to introduce many new students and amateur mycologists to the myxomycetes, as well as entice professional mycologists to seek out myxomycetes in nature, and devote more time to myxomycetes in general mycology and biodiversity-oriented classes.

The book is arranged in six chapters. The first includes an introduction to basic biology and life cycles of slime molds. The second describes and illustrates with clear drawings and photographs the taxonomic characters used for identification. The third describes methods for collecting and culturing myxomycetes, including step-by-step methods for isolation from bark and other substrates, as well as a guide to construction of a myxomycete herbarium using cheap, readily available materials. This chapter will be particularly useful to biology teachers who wish to incorporate myxomycetes into their courses. The fourth chapter discusses biogeography of myxomycetes and characteristic myxomycetes of specialized habitats, such as snow-melt areas. The fifth chapter concerns myxomycete ecology, including interesting, often suggestive, discussions on associations between myxomycetes and insects, fungi, and bryophytes. Chapter six, on classification and identification, makes up the bulk of the book. Brief passages on nomenclature and the structure of hierarchical classifications are followed by keys to the orders of myxomycetes, and selected species in each order. Next come the descriptions and illustrations for each of the 56 species found in the key. For each species, there is an illustration showing macromorphology of the sporangia or plasmodiocarp as well as anatomical sketches of spores, capillitia, etc. Nineteen of the species are also illustrated in the excellent watercolors presented in the color plates (one of my favorites includes a developmental series showing ontogeny of *Stemonities axifera* sporangia). With only 56 species in the key, this is not meant to be an exhaustive treatment of all myxomycete species. Nevertheless, under the "comments" section for each species, closely related or similar species and their diagnostic characters are discussed. Thus, in the Preface, this book is justifiably presented as "a field guide to approximately 175 of the common species of myxomycetes." The glossary that follows the species descriptions will be appreciated by students trying to work the keys. The thorough list of references will provide entry to specialized literature and encourage further study.

This is an attractive, beautifully produced book. In fact, one of my only negative comments is that it may be too pretty to take into the field. The hardcover format with dustjacket does not lend itself to being stuffed into a pocket or collecting basket. A more substantive criticism concerns the section in the introductory chapter with the heading, "What are Myxomycetes?" Here the authors recall the conflicting classifications of myxomycetes either as fungi or as Mycetozoa, related to animals, and conclude that "whatever their relationships to other living organisms, study of myxomycetes has been, and still is, carried out by botanists, particularly mycologists." Although this statement is true (if vague), it does not reflect the current understanding that myxomycetes are not in the same lineage as the chytrids, zygomycetes, ascomycetes, and basidiomycetes, and therefore are *not* true fungi. However, this is a minor criticism of an otherwise excellent book that will undoubtedly increase awareness and appreciation of myxomycetes. I recommend it highly. *D.S.H.*

MYCOTAXON

Volume LIV, pp. 485 April-June 1995

NOTICE: CHANGE OF MYCOTAXON BOOK REVIEW EDITOR

Mycotaxon wishes to announce to our readers a change of Book Review Editor. David S. Hibbett, Harvard University Herbaria, USA, has set right to work and prepared the Book Reviews that appear in this volume. Please make a note to send books or correspondence regarding book reviews to the following address:

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Doctor Hibbett is only the third Book Review Editor for *Mycotaxon*. We take this opportunity to acknowledge the contributions of, and, express our gratitude to Linda M. Kohn, University of Toronto, Canada, who served as Book Review Editor for volumes 41 (1991) through 52 (1994), and, Grégoire L. Hennebert, Université Catholique de Louvain, Belgium, who initiated the Book Review feature in *Mycotaxon* volume 1 (1974), and published reviews through to volume 40 (1991). Doctor Hennebert continues to serve the journal as French Language Editor and member of the Editorial Advisory Board.

MYCOTAXON

Volume LIV, pp. 486 April-June 1995

NOTICE: SALE OF *FUNGAL MORPHOLOGY AND ECOLOGY*
by A. Tsuneda, 1983

Fungal Morphology and Ecology - Mostly Scanning Electron Microscopy by A. Tsuneda, 320 p., 624 fig., 142 ph. pl., 4°, hardcover, 1983. $25.00 US.

Fungal Morphology and Ecology is now for sale at a very reasonable price. This book originally sold at $25.00 US, but due to a drastic change in the yen-dollar exchange rate, its recent price had risen to $60.00 US. This book is now on sale at its original price of $25.00 US, including handling and postage costs to make it accessible to a wider spectrum of posible readers, including biology teachers and their students.

This mycology illustrates the great diversity of life styles and activities of fungi, using over 600 figures. Most of the figures are SEM or TEM micrographs which are nicely reproduced and delightful to see. The text consists of three chapters: (1) Introduction, (2) Taxonomy and morphology of fungi, and (3) Ecology of fungi. In the Introduction, major characteristics of fungi, especially their cell structures are discussed and illustrated in comparison with those of other organisms. In the second chapter the structure, development, and method of spore discharge of diverse fungi ranging from the Myxomycetes to the Basidiomycotina are shown, using original micrographs wherever possible. Fungi belonging to the hyphomycetes are categorized on the basis of conidium ontogeny. The third chapter deals with such aspects as (i) saprobic fungi and their sucession on natural substrates, (ii) fungal interactions with other fungi and other organisms, and (iii) survival in diverse conditions. Important concepts in categorizing the fungal interactions, e.g., antagonism (antibiosis), parasitism, commensalism, and mutualism are discussed and illustrated. Various survival structures are demonstrated in the final section with emphasis on the morphological variations among sclerotia of different genera. Reviews of this work appeared in *Mycotaxon* 20: 685. 1984, and, *Mycologia* 78: 981-982. 1986.

This price is very low. Do not miss this opportunity!

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MYCOTAXON

Volume LIV, pp. 487 April-June 1995

NOTICE: BRITISH MYCOLOGICAL SOCIETY CENTENARY 1896-1996

An ambitious series of events is being planned to celebrate the Centenary during 1996.

I. **Symposia**: 3 days of symposia at the University of Sheffield from April 10-12th:

1. **"A Century of Mycology"** including papers by distinguished contributors who will review and bring up to date progress made during the past century of a selection of topics in which British mycologists have made especially significant advances.
2. **Biodiversity:** A currently topical theme with invited speakers, many from overseas. Coverage will range from the molecular to ecosystem level.
3. **Postgraduate Symposium:** The mycology of the future. Recently qualified postgraduates will be invited to present papers or posters describing their work and to compete for prizes for the best paper and for the best poster.

II. Grand Conversazione: A 3 day event to be held in the Old Hall, Royal Horticultural Society Halls, Vincent Square London from 26-28 September. There will be 100 exhibits covering mycology in all its branches.

III. Forays. Several forays are planned including:

1. **Spring Foray** near Hereford with the Woolhope Club (forerunners of the British Mycological Society).
2. **Autumn Foray** at Huddersfield with the Mycological Committee of the Yorkshire Naturalists' Union. It was at a Y. N. U. meeting in Huddersfield that the intention to set up a "National Committee" was announced in 1895, implemented the following year in Selby.
3. **Overseas Foray** in Eastern France in association with the Societé Mycologique de France.
4. **Commemorative Forays:** day forays will be organised by local groups.

IV. Publications. Several publications are planned:

1. A symposium series volume based on "A Century of Mycology" and possibly one based on the Biodiversity symposium.
2. "Biographical notes on British Mycologists" by G. C. Ainsworth.
3. "Atlas of British Fungi." Fascicles of maps of selected groups of British fungi.
4. "Recording and Mapping British Fungi."
5. Centennial Reviews in *Mycological Research:* reviews of selected mycological topics chosen to reflect developments initiated by British mycologists.

For further information or comment on the arrangements for the centenary celebrations please write to Professor John Webster, Department of Biological Sciences, University of Exeter, Hatherly Laboratories, Prince of Wales Road, Exeter, EX4 4PS, U. K.

ERRATA, VOLUME FIFTY-TWO

Page 281 last line *for* [5.5-10.9(-11.7) µm, immersed in a gel. Medullary excipulum] *read* [5.5-10.9(-11.7) µm, immersed in a gel. Medullary excipulum textura intricata, cells yellowish-brown, (1.6-) 2.3 (-3.1) µm wide. Stipe cortex textura globosa-angularis, immersed in a gel,]

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